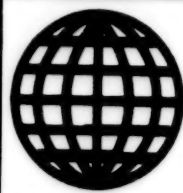


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20 June 1994



**FOREIGN
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CONTENTS

20 June 1994

WEST EUROPE

ADVANCED MATERIALS

France: Method Discovered for Cold Polishing of Cast Iron, Steel [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT, 20 May 94] ..	1
France: Ultra-Microelectrodes Created for Research on Molecules [C. Amatore; Paris SCIENCES ET Avenir, May 94] ..	1
Germany: Spray Processor Replaces Immersion Bath in JESSI Project [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT, 24 May 94] ..	1
Germany: Ion Beam Cannon Helps Reduce Size of Semiconductors [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT, 25 May 94] ..	1
Germany: Fiber-Reinforced Heavy-Duty Ceramics Envisioned for Materials Development [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT, 26 May 94] ..	2

AEROSPACE

France: Ariane 5 Fuel Tank Passes Qualification Tests [Paris LA LETTRE DU GIFAS, 13 Apr 94] ..	3
France: Solar Cells Achieve Record Performance Far From Sun [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT 11 May 94] ...	3
France: SNECMA's Strategic Priorities Outlined [J. Jacquier; Paris L'USINE NOUVELLE, 12 May 94] ..	3
France: Aerospatiale Chief on Future Large Aircraft Project [Paris AFP SCIENCES, 11 May 94] ..	5
France: Atmospheric Reentry Demonstrator Presented [J. Croize; Paris LE FIGARO, 1 Jun 94] ..	6
Protective Shield ..	6
NEC SX-3R Supercomputer on Line at German Aerospace Research Establishment [H. Niemann; Frankfurt/Main FRANKFURTER RUNDSCHAU, 30 Apr 94] ..	7
ESA Restructures Programs [Bonn LUFT- UND RAUMFAHRT No 1, Jan-Mar 94] ..	7
European Rocket Engine Makers Unite to Develop Improved Propulsion Systems [Duesseldorf HANDELSBLATT, 13-14 May 94] ..	8
Germany: Joint European Cooperation in Turboprop Development [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT, 25 May 94] ..	9
Germany: ILA To Play Mediator Role Between East, West in Space Activities [W. Engelhardt; Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT, 26 May 94] ..	10
Germany: DASA Develops Silicon Photocells With 25-Percent Efficiency [Paris AFP SCIENCES, 11 May 94] ..	11
Finland Builds First Satellite Prototype [P. Winckelmann-Zilliacus; Helsinki HUFVUDSTADSBLADET, 30 Apr 94] ..	11

AUTOMOTIVE INDUSTRY

France: PSA, Fiat Automobile Plant Inaugurated ..	12
Merger's Antecedents [Paris LE MONDE, 17 May 94] ..	12
New Venture Profiled [J. Lore; Paris LE MONDE, 18 May 94] ..	13
Germany: Hydrogen Fuel Cell Developed for Zero-Emission Vehicle [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT, 15 Apr 94]	14
Germany: Electric Superdrive Enhances Hybrid Vehicle Propulsion [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT, 20 Apr 94]	14
Germany: Hybrid Vehicles Combine Advantages of Electric and Internal Combustion Engines [G. Ludwik; Berlin INGENIEUR DIGEST in German, Apr 94] ..	14

Germany: Service Robots Featured at Hannover Trade Fair [Berlin <i>INGENIEUR DIGEST</i> , Apr 94]	16
Germany: New Gas Turbine Concept Developed at ASEA Brown Boveri AG [O. Vincenz; Berlin <i>INGENIEUR DIGEST</i> , Apr 94]	18
Germany: Approximately DM3.8 Million Earmarked for Alternate Energy [G. Ludwik; Berlin <i>INGENIEUR DIGEST</i> , Apr 94]	19

BIOTECHNOLOGY

France: Medicine for Cystic Fibrosis Through Plant Transformation [Paris <i>LE MONDE</i> 1 Jun 94]	20
Germany: Interferon Gamma from Bacteria Mimics Natural Model [Frankfurt/Main <i>FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT</i> , 8 Apr 94] ..	21
Germany: DM100 Million Appropriated for Gene Therapy Research [Frankfurt/Main <i>FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT</i> , 13 Apr 94]	21

COMPUTERS

France: Bull To Sell Mainframes With New Cisc Processors [Paris <i>ELECTRONIQUE INTERNATIONALE HEBDO</i> , 5 May 94]	22
Siemens-Toshiba-IBM Cooperation to Develop 64-MB Storage Chip [Frankfurt/Main <i>FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT</i> , 26 May 94] ..	22

DEFENSE R&D

Germany's Rexrodt: Changes Needed in Technology Policy [Frankfurt/Main <i>FRANKFURTER ALLGEMEINE</i> , 9 Jun 94]	23
---	----

ENERGY, ENVIRONMENT

Germany: Waste Tar Converted Into Fuel [Wuerzburg <i>UMWELTMAGAZIN</i> , Mar 94]	23
UK: British Industry Works Toward Voluntary Environmental Protection [A. Noeldechen; Frankfurt/Main <i>FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT</i> , 19 May 94]	23

FACTORY AUTOMATION, ROBOTICS

France: Cirtes Launches Rapid Prototyping Software [D. Chabbert; Paris <i>L'USINE NOUVELLE</i> , 12 May 94]	25
Germany: Automation, Robotics Seen as Keys in Industrial Development [Frankfurt/Main <i>FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT</i> , 7 Apr 94] ..	26
Germany: High-Efficiency Micropump Developed for Gas-Liquid Transport [Frankfurt/Main <i>FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT</i> , 19 May 94] ..	28
Italy: Fiat's Latest Production Plant Described [G. Di Santo; Milan <i>ITALIA OGGI</i> , 21 May 94] ..	28

LASERS, SENSORS, OPTICS

UK: New Liquid Crystal Technology Conserves Electric Energy [Frankfurt/Main <i>FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT</i> , 30 May 94] ..	29
Germany: Four-Dimensional Simulation Augments Human Vision [P. Winandy; Frankfurt/Main <i>FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT</i> , 8 Apr 94]	29
Germany: Laser Interferometer Developed for Biotech Applications [Frankfurt/Main <i>FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT</i> , 27 May 94] ..	30

MICROELECTRONICS

France Telecom, CEA Develop 0.35 Micron CMOS Process [P. Loubiere; Paris <i>LIBERATION</i> , 16 May 94]	30
Germany: Siemens To Build New Semiconductor Plant [Paris <i>ELECTRONIQUE INTERNATIONALE HEBDO</i> , 5 May 94]	31

European ESPRIT Consortium To Develop Flat Panel Displays [Luxembourg INNOVATION AND TECHNOLOGY TRANSFER, Apr 94]	31
European Firms Attain Profitability, New Products in Microelectronics [B. Boendel; Duesseldorf WIRTSCHAFTSWOCHE, 6 May 94]	32

TELECOMMUNICATIONS

France: Status of Plans for Information Superhighway [L. Alary-Grall; Paris MESSAGES, Mar/Apr 94]	35
France: Silicon-Germanium Alloy for Bipolar Transistors [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT, 15 Apr 94]	36
France: Special Properties Designed Into Chemical Materials [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT, 27 Apr 94]	36
Germany: Satellites, Cable To Transmit Digital TV in Europe [K. Tetzner; Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT, 22 Apr 94]	37
Germany: Alcatel SEL Undergoes 11-Percent Decrease in Turnover in 1993 [Munich COMPUTERWOCHE, 13 May 94]	38
Italy: National Telecom Company Projects Described [C. Donat-Cattin; Turin MEDIA DUEMILA, Apr 94]	38
Mobile Radio to Gain Equal Footing with Other Systems [U. Kranz, G. Sodhi Interview; Duesseldorf VDI NACHRICHTEN, No 14, 8 Apr 94]	40

EAST EUROPE

DEFENSE R&D

Romania: Threats to Research Funding Described [Bucharest ROMANIA LIBERA, 21 Apr 94]	43
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ADVANCED MATERIALS

France: Method Discovered for Cold Polishing of Cast Iron, Steel

94WS0364D Frankfurt/Main FRANKFURTER
ZEITUNG/BLICK DURCH DIE WIRTSCHAFT
in German 20 May 94 p 8

[Text] Frankfurt. With the help of a new process from the French company Agicom, tools made out of iron, cast iron and steel can now be cold polished. The technique is much more cost effective than the usual [method of] polishing at a temperature of 140°. Furthermore, the manufacturer can dispense with the strongly alkaline solvent which was previously necessary and required special safety precautions.

The tool is immersed in a cold alkaline solution only for cleaning. The actual bath in the polishing fluid is amazingly brief: the process is completed in one to three minutes. Protective rust-resistant and water repellent films can be applied in additional steps.

The comparatively small investment costs for the installation of such equipment make polishing castings affordable for the first time to small and medium-sized companies, according to Agicom (13 rue Louis Gamera, F-06300 Nice). Smaller quantities can also be processed at reasonable cost, because the immersion bath always stands ready [for use] and requires less energy than the previous, hot techniques.

In addition, the method does not require elaborate safety measures: there is no fear of hot steam which could lead to undesirable side reactions. Finally, it is argued that polishing at room temperature also benefits the tools, which are easily deformed in heat.

France: Ultra-Microelectrodes Created for Research on Molecules

BR1306102694 Paris SCIENCES ET AVENIR
in French May 94 p 19

[Article by Christian Amatore: "The Molecule Spy"]

[Text] Chemistry is full of excitement. There is frenzy, explosion, turmoil—but also there are microscopic phenomena, to which Christian Amatore has devoted his time. This "research maniac," director of the Molecular Activation Processes Laboratory (CNRS) [National Scientific Research Center] at the Ecole Normale Supérieure, has developed ultra-microelectrodes, a kind of "microscope to watch molecules reacting." This tool is revolutionary, both for guiding the synthesis of new materials and for observing the exchange of neurotransmitters in the brain, and has won its inventor the CNRS silver medal.

His work has opened up a new field of applications. Air Liquide and CGE [General Electricity Company] are

both exploiting the process, the former to develop biomimetic systems for separating and concentrating oxygen in the air, the latter to design materials for optoelectronics.

Biologists in particular, notably American Mark Wightman (University of South Carolina), are interested in this "ultra-fine activity scanner" enabling the molecules of neurotransmitters emitted at synapse level to be counted, or the effect of drugs on a rat's brain to be measured. Investigations are only just starting.

Germany: Spray Processor Replaces Immersion Bath in JESSI Project

94WS0371A Frankfurt/Main FRANKFURTER
ZEITUNG/BLICK DURCH DIE WIRTSCHAFT
in German 24 May 94 p 10

[Text] Frankfurt. Jessi offices in Munich report that a spray processor for use in semiconductor production has been developed within the framework of a Jessi project. This completely automatic unit, called the ACC4, has been designed for treating silicon wafers 150 mm in diameter.

Instead of treating the wafers in chemical baths, as has been done to date, a process that has become increasingly difficult because of the continual reduction in structural widths, the spray processor removes the chemicals from large containers, and then filters, mixes, and heats them before spraying the rotating wafers. In this way, the liquid is evenly distributed on the wafer surface, a higher operating temperature with a shorter treatment time is achieved, and the reproducibility of the production process is improved.

Currently, 150 to 300 wafers per hour can be treated in this way. Drying is performed by means of heated nitrogen, thereby making a closed "dry-in/dry-out" processing cycle possible. The four partners in the Jessi project—Blomrne, Sapi Equipments, Leti, and Philips RTL—are now developing a similar system for wafers 200 mm in diameter. It is expected to be ready in the second half of 1995.

The present system uses less energy and is about 30 percent cheaper than other competitive systems. Planned improvements in the process are aimed at reducing the amounts of chemicals and deionized water even further.

Germany: Ion Beam Cannon Helps Reduce Size of Semiconductors

94WS0371C Frankfurt/Main FRANKFURTER
ZEITUNG/BLICK DURCH DIE WIRTSCHAFT
in German 25 May 94 p 8

[Unattributed article: "Max Planck Researchers in Heidelberg Achieve Structural Widths of 80 Nanometers"]

[Text] Frankfurt. Researchers at the Max Planck Institute (MPI) for Nuclear Physics in Heidelberg are currently investigating a gas-field ion source (GFIS) that can generate particularly fine, highly intense ion beams. This device, called the GFIS cannon, now makes it theoretically possible to produce and investigate structures in the nanometer scale range, with an eye to applications in materials science, environmental control, and medical/biological research.

The ion beams are generated in a very high electrical field to an extremely fine peak. A special peak geometry (superpeak) makes the ion beam extremely narrow and the radiation about 1,000 times "brighter" than is the case in normal field emission peaks. The life of the "superpeak" can now be extended to the point where even industrial utilization is feasible.

Professor Siegfried Kalbitzer, director of the Nuclear Solid State Physics and Materials Science Working Group at the Max Planck Institute for Nuclear Physics, notes in the MPI journal SPIEGEL that this ion source has already been able to achieve an image point diameter of about 80 nanometers and that it seems possible eventually to reach a diameter of 10 nanometers.

"While classical semiconductor technology currently plans structural elements having the finest structures at 100 nanometers, structures at 10 nanometers will open completely new avenues," Kalbitzer predicts. One first simple application of focussed ion beams, which has already been tested in Heidelberg, is the generation of optical patterns in semiconductors (silicon or silicon carbide). When a thin, transparent layer of such crystals is irradiated with a sufficiently high dose of heavy ions, the ions destroy the crystals in the irradiated areas. The material in those areas becomes formless (amorphous).

Amorphous silicon has optical properties that are different from crystalline. When the light wavelengths are right, a clear "bright-dark" contrast, suitable for storing the patterns, is observed. Crystals only reform in an amorphous spot at temperatures of 600°C. When the ambient temperatures are in the normal range, information can be stored for a long time.

Kalbitzer calculates that a beam diameter of 100 nanometers will permit up to 10 billion bits to be written in one square centimeter of storage area. This is about a hundred times greater capacity than the current storage densities. A 100 cm²-area disk is therefore able to record a billion data points or a text volume of 100 million DIN-A4 pages. Should it ever become possible to approach the structural realm of 10 nanometers, even far greater storage densities would of course be possible.

Ion beam technology can also find applications in micro-mechanics and microchemistry. The Heidelberg researchers have shown that a neon ion beam can be used to etch fine patterns in thin copper wires, for example. Because secondary electrons, which can be captured on a screen, are released in this process, it

therefore becomes possible to observe and even control the progress of microtechnical processing.

Moreover, this kind of system permits highly precise cutting procedures to be performed, as, for example, preparative cuts on organic molecular compounds, microorganisms, and all sorts of specimens. In Kalbitzer's opinion, the exposure of photoresists with ion beams would be a very interesting experiment, in that the desired patterns could be written in substantially shorter times through the use of ion beam lithography. This becomes even more advantageous, the larger the wafer surfaces to be described and the higher the structural densities become.

Germany: Fiber-Reinforced Heavy-Duty Ceramics Envisioned for Materials Development

94WS0372B Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 26 May 94 p 8

[Unattributed article: "New Materials Offer Advantages to General Mechanical Engineering"]

[Text] Frankfurt. Germany's MAN Technologie AG considers it high time that the mechanical engineering field, as a whole, avails itself of the numerous applications of newly developed fiber-reinforced heavy-duty ceramics. These materials are currently being tested for use as pump and bearing parts, which, for example, could be used in the aviation and space industry.

MAN Technologie AG, in cooperation with the Federal Ministry of Research, has been involved in the applications-oriented development of fiber-reinforced heavy-duty ceramics for some time now. On the basis of a known, but radically modified process, MAN Technologie has been producing semifinished products in the form of plates, pipes, and profiles. The automatic process-control system in its pilot plant has made it possible to reduce the so-called matrix infiltration time of the semifinished products by several hours. Using this system, a component having a wall thickness of 10 mm now requires only 80 hours of matrix infiltration process. Other processes would require four times this amount of time.

In technical ceramics the ceramic matrix is reinforced by means of implanted ceramic fibers. Fracture toughness and breaking strain are thereby substantially increased. The material is made error- and damage-tolerant, and consequently more reliable. In addition, the thermo-shock resistance of the material reaches a level inaccessible to monolithic ceramics. Various research institutes have been studying such composite materials, also called ceramic matrix composites, for a long time.

AEROSPACE

France: Ariane 5 Fuel Tank Passes Qualification Tests

BR0106100494 Paris LA LETTRE DU GIFAS
in English 13 Apr 94 p 1

[Unattributed article: "Aerospatiale: Qualification for a Cryotechnical Tank for the Ariane 5"]

[Text] GIE Cryospace (a joint venture made up of Air Liquide and Aerospatiale) has recently obtained qualification for a large tank for the main cryotechnical (EPC) stage of the Ariane 5. This structure is made up of two compartments, one for liquid oxygen (LOx) and the other, for liquid hydrogen (LH2). Qualification was obtained by executing a burst type rupture test. Rated flight pressure for the tank are 4.8 bars for the LOx compartment and 2.4 bars for the LH2 compartment. For the test, internal loads were simulated by pressurized nitrogen and local external stress by hydraulic actuators. Testing was done in a pit 30 meters deep and 9 meters in diameter, at the Cryospace premises at Les Mureaux during the night of 16 to 17 February. Pressures reached during rupture complied perfectly with anticipations. Nearly 700 measuring probes were placed on the structure, which, during the test, swells by several centimeters in height and several tens of centimeters in breadth. The rupture test was done using a tank identical to the flight model, except for the hydrogen compartment, which was shortened. Results will enable specialist from Cryospace and Aerospatiale, industrial architect and stage builder of the Ariane 5 to validate structural skin covering dimensions to determine safety margins adapted to flight pressures and fine tune computational modules for future tanks.

Contact: Mr. A. Bloch; Telephone: 33 (1) 42-24-24-01

France: Solar Cells Achieve Record Performance Far From Sun

94WS0366A Frankfurt/Main FRANKFURTER
ZEITUNG/BLICK DURCH DIE WIRTSCHAFT
in German 11 May 94 p 8

[Text] As commissioned by the European space organization ESA in Paris, European industry has developed high performance solar cells which are particularly suitable for use in missions far from the sun where the technology of [providing] energy is difficult. ESA reports that under the conditions which dominate in distant space, the solar cells reach an efficiency factor of 25 percent. This is the highest efficiency factor yet attained with silicium cells without the use of optical concentrators.

According to reports, the silicium cells are 6 x 4 centimeters in size. ESA had already made the first breakthrough about a year ago, an efficiency factor of 23 percent, which was, however, achieved using 2 x 4

centimeter gallium-arsenide cells. The new record performance with silicium is credited to a team of companies under the direction of DASA [German Aerospace] (Heilbronn), to which the Milan company Cise also belongs, which was already responsible for the development of the gallium-arsenide cells.

The progress is particularly noteworthy, because European space flight cannot rely on the thermoelectric radioisotope generators (TRG) used elsewhere, which are employed to supply energy for missions into deeper space. In addition, the solar cells currently used in space flight are generally not designed for such low temperatures and such meager radiant [solar] intensity, [conditions] which must be taken into consideration at greater distances from the sun.

In orbits near the sun they have an efficiency factor of 10 to 20 percent, but they lose their efficiency in distant space. For example, the radiant intensity of sunlight on Jupiter is only five percent of its intensity near the Earth. The equilibrium temperature of the solar cell designs falls to about minus 100°C at these distances.

France: SNECMA's Strategic Priorities Outlined

94WS0369A Paris L'USINE NOUVELLE in French
12 May 94 pp 24-25

[Article by Jean-Francois Jacquier: "SNECMA: Three Challenges To Meet by 1997"—first paragraph is L'USINE NOUVELLE introduction]

[Text] New markets, new alliances, and shortened production cycles. The French engine builder believes the only way to pull out of the recession is to break with the past...

"We're not going to see another 'miracle' like the CFM-56. Our competitors will not allow it." Financial problems, battles for technology, collapsing markets: Yves Bonnet, general manager of SNECMA [National Company for Aircraft Engine Design and Construction], knows the company can count on very little outside support in its struggle for economic recovery.

In a sector likely to see increasing concentration, SNECMA has no choice. If it wants to defend its position, its markets, and its research, it must get back into the black as soon as possible.

New Markets

Once a supplier of products for exclusively military use, SNECMA has succeeded over the last 5 years in becoming the third largest company in its field, thanks to a cooperative alliance forged 20 years ago with global leader General Electric [GE] (United States). The market-penetration achieved by the CFM-56 family of jet engines under a 50-50 partnership with GE lifted it to the ranks of a world-class engine builder. With 6,500 units in service for close to 200 clients, the CFM-56 is the world's best-selling jet engine.

Alas! It has had to pay a price for this success. When the full force of the recession in the air transport market hit, SNECMA was too much a one-product company. CFM-56 deliveries dropped from 900 in 1991 to 500 in 1993, resulting in a 30-percent decline in sales volume. In the last 2 years, it has suffered annual losses of 600 to 700 million [French] francs [Fr]. The group suddenly realized it was overly dependent on GE. If business generated by the partnership with the Cincinnati engine builder were to decline further, 75 percent of its activity would be threatened.

Thus the company had to take action. Especially since its president, Gerard Renon, does not expect an overall recovery in the sector before 1997. "Even then," he says, "only companies that have developed new products will survive." So SNECMA decided to gamble: It would expand its product offerings in a bid to secure new market outlets. This meant branching out to the civilian sector, of course, but also broadening its military base. Formerly it supplied warplane engines only to Dassault, but now it is prepared to equip foreign aircraft too, though the latter are not really competitors to any great extent. It has recently proposed building a new version of the M-88, the Rafale's engine, to power the Swedes' Grippen. Discussions are also under way with South Korea on provision of a modified M-88 to power a single-engine trainer.

In the civilian market, a number of needs have been identified. First, at the low end, for regional aircraft with fewer than 100 seats, demand for which is going to accelerate in Europe and Asia. Looking ahead to the year 2009, replacement of the oldest Airbus (A300 and A310) should open up opportunities for engines with thrust in the range of 40-50,000 pounds. Over the longer term, finally, a successor to the CFM-56 will need to be developed.

New Alliances

The problem is, with development costs for a new engine starting at a minimum of Fr1 billion, SNECMA may not be in a position to follow through. It now spends close to Fr4 billion per year—about 31 percent of total sales revenue—on research and industrial development. It is no longer able to sustain that spending level, which is substantially greater than the percentages spent by rivals (15 to 20 percent). Both its adversaries (Rolls-Royce, Pratt & Whitney) and its principal partner (GE) are two to four times as big.

In order to compensate for this handicap, and despite the fact that "cooperation with GE remains indispensable," the French firm has entered into a number of alliances with new partners. With Rolls-Royce, SNECMA is working to acquire technology for the warplanes of the 21st century. Also in the military domain, it has just signed a preliminary agreement with Russia's Mikoyan for manufacture under license of the Larzac, an engine developed in association with Turbomeca. Another accord has just been concluded with Germany's MTU

and Italy's Fiat Avio for research on an engine for the FLA, the future European tactical transport aircraft.

In the field of low-power civilian engines, those targeted at the regional aircraft market, SNECMA has signed letters of intent to cooperate not only with GE but also with MTU [Motor and Turbine Union, Inc.] and Pratt & Whitney. The partnership would be based on development of a civilian spinoff of the M-88 that may also be of interest to the Japanese for their YSX. Other discussions are under way with Russia's Perm for a 40,000-pound [i.e., thrust] engine, a market niche where GE is not a player.

Production Cycles

Obviously, such a policy would have no chance of succeeding unless SNECMA had some good technological arrows in its quiver. Even so, it will need to redouble its efforts to improve productivity. The objective is to reduce both costs (30 percent) and development time (1 year) for new engines. To meet new demands, the company's production facilities are going to have to match the faster pace set by airplane builders. For example, now that Boeing has decided to shorten production time for its airplanes from 18 to 14 months by 1996, SNECMA will have to deliver its engines in 4-1/2 instead of 6 months, if it wants to remain a player.

That means a complete overhaul of work procedures, including elimination of excess layers of hierarchy, autonomy for production units, creation of expertise hubs that bring together research laboratories, study bureaus, and the manufacturing side. A breakdown of old structures is under way.

"Aeronautics is no longer a separate industry," proclaims Jacques Bouhelier, the just-named director for comprehensive quality control. "In the future, engine-building will evolve more in the direction of client services," confirms Alain Habrard, director of development. Airlines will not want to have to worry about repair or maintenance of their engines. There will come a time when they want services at flight time. SNECMA has already begun offering this type of contract, and is considering a top-to-bottom overhaul of its commercial network.

If it perseveres to the end, the state-owned company's gamble will pay off. The most difficult part will be getting back into the profit column within the next 2 to 3 years. SNECMA may be in a position then to make a comeback and take in private-sector shareholders. Solid financial footing, broad international base—the vision is well fleshed-out. But just bringing in private investors will not substitute for the planned reforms, which are essential if the company is to prosper in a highly competitive market.

[box, p 24]

Subsidiaries Adapting

In 1993, only two of SNECMA's five subsidiaries—SEP, which builds the Ariane's engines, and Techspace Aero, formerly FN [National Arms Factory] Engines, in Belgium—posted profits. Gerard Renon, the group's president, offers this analysis: "In an environment of such frenzied competition, we can no longer let them remain simple subcontractors for the parent company." Their survival depends on their ability to establish themselves as prime contractors on the international market. An objective which in most cases means more alliances. Thus Messier-Bugatti has decided to join forces with Britain's Dowty in the landing-gear domain. In the field of engine nacelles and thrust reversers, Hispano-Suiza is entering into collaboration with Grumman (United States). Sochata's maintenance activities may be reintegrated into SNECMA itself. [end box]

[box, p 25]

Technological Strike Force

SNECMA's strength depends on the upstream organization of its research effort, which is based on a network of 80 research organs, laboratories, and universities both in France (ONERA [National Office for Aerospace Studies and Research], CNRS [National Scientific Research Center], CART, etc.) and overseas (Europe, the United States, Russia). Forced to compensate for its relatively small size, it gets as much mileage as possible from computer simulation, which saves time and avoids costly testing. Starting from scratch after the Liberation [i.e., near the end of World War II], SNECMA is one of the few engine builders in the world that has been able to design and build military aircraft engines without external assistance. The M-88, developed for Dassault's Rafale, is a distillation of expertise that will offer performance superior to that of any competitor. Compared with the J200 destined for the EFA [European Fighter Aircraft] and Pratt & Whitney's ATF [advanced tactical fighter] engine in particular, it will offer higher turbine injection temperatures and an unprecedented thrust-to-mass ratio on the order of 10 daN/kg. That presupposes complete mastery of new materials technologies. Likewise, in the civilian domain, SNECMA has obtained remarkable blower efficiency and compression rates. These technological advances have not been purchased at a cost to reliability. For example, the failure-in-flight rate of the CFM-56-3 is almost 20 times less than that of rival Rolls-Royce's V 2500. With some 2,000 engineers on its rolls, "SNECMA is, from a technical standpoint, up there with the best—perhaps even better," boasts Jacques Caruel, the group's technical director.

SNECMA Engines

- CFM-56: The result of a 50-50 partnership with GE, it has made SNECMA a leader in the civilian market, with 6,500 units in service.
- M-88: Developed for Dassault's Rafale, it is a distillation of the most advanced technologies. It will be offered for export in various versions.

- GE-90: With so much experience under its belt, SNECMA is now moving ahead on the GE-90, the world's largest aircraft engine. Its new objective: to be prime contractor for a major civilian program. [end box]

France: Aerospatiale Chief on Future Large Aircraft Project

BR1306143394 Paris AFP SCIENCES in French
11 May 94 p 12

[Unattributed article: "'Future Large Aircraft Launch Possible Without British,' Says Gallois"]

[Text] Nice—The launch of the European military transport aircraft, the FLA [Future Large Aircraft], is possible even if Britain does not order it and even if British industry does not play a part in its production, according to the view put forward on 7 May by Aerospatiale Group President Louis Gallois.

"We would like to have the British with us for industrial reasons—the manufacture of the wings—commercial reasons—a potential British order for 60 aircraft—and for the sake of the Airbus system's credibility," Gallois stated, "but we could still do it if they do not join us".

The FLA project—for which pre-feasibility studies were begun at the end of 1993 by the four partner countries in the Airbus consortium (France, Germany, Britain, and Spain) as well as by Italy, Portugal, Turkey, and Belgium, which are all members of the Euroflag consortium—recently received funding in France worth 2 billion French francs [Fr], allocated by the military planning legislation for 1995-2000.

This military transport aircraft, which should allow the Europeans to remain independent and not have to purchase American equipment—the Hercules C-130J manufactured by Lockheed—or Russian aircraft—the Antonov-77—has a market estimated by Aerospatiale at 300 aircraft: 60 to 80 for France, 75 for Germany, 40 to 50 for Italy, 39 for Spain, 33 for Turkey, 10 for Portugal, between 13 and 18 for Belgium, and around 60 for Britain. The British must in fact choose, before the end of the year, the name of the aircraft due to replace half their fleet of aging C-130s. The members of Euroflag, including British Aerospace, naturally support the FLA against the C-130J proposed by Lockheed, which is available at an earlier date.

"If they buy 30 C-130Js in the first phase, the industrial effect of keeping a uniform fleet will be so great that they will be persuaded to take the EC-130 for the second phase, especially since they will have enabled Lockheed to restart its production lines," Gallois predicted. In addition, "if Britain does not come to us, it will not be possible to assign the work to British industry. Taxpayers in continental countries would never put up with the idea of financing work being carried out in Britain".

In response to accusations of excessively high prices, Gallois said that the manufacturers "were setting themselves the challenge" of offering 300 aircraft at the same price as the C-130J (an estimated Fr300 million).

France: Atmospheric Reentry Demonstrator Presented

BR0606141294 Paris LE FIGARO in French 1 Jun 94 p 12

[Article by Jean-Paul Croize: "Forerunner to European Space Vehicles: A Model Capsule Built To Withstand Atmospheric Heat"]

[Text] Construction of the Community's Ariane super-launcher continues, as does the preparation of the first vehicles destined to service the international orbital station, R-Alpha, from the year 2001.

On its very first flight, scheduled for the Spring of 1996, the ESA's [European Space Agency's] future Ariane 5 rocket should be launching an automated space capsule foreshadowing those which Europe intends to use at the beginning of the next century to put its astronauts into space. Presented yesterday by representatives of Aerospatiale's "Space Defense" division, this project, called "ARD" [Atmospheric Reentry Demonstrator], will be a very important technological step towards European manned flight autonomy. It will in fact make it possible to test the various types of material which could be used to make the future capsule's heat shield, as well as the guidance systems which will give considerably improved landing accuracy compared to earlier space vehicles of this type.

Distance From Ground is 1,200 Kilometers

While Ariane 5 is slowly taking shape at Les Mureaux, near Paris, where Aerospatiale is starting to build the first flight model (the first one should take off in the Fall of 1995), the engineers feel that the future of this heavy launch vehicle must be prepared for right now, particularly with respect to the manned flights which its reliability rating, "boosted" to more than 99 percent (whereas current versions of the European launcher only achieve 95 percent), will render possible.

It is in order to prepare for a new activity, as far as Europe is concerned, that Aerospatiale has just launched the ARD project: costing in the order of 200 million French francs [Fr], it will consist of the production, in just over two years, of an Apollo-type space capsule weighing 2,800 kilograms. "It is our understanding of the technologies connected with ballistic reentry and our skills in the technical management of large space systems which will allow us to carry out this program in such a short time," explains Bernard Humbert, who is in charge of "manned flight" activities at Aerospatiale.

Of course, this ARD capsule will only be an unmanned prototype. However, its already respectable size will bring it very close to the future "CTV" [Crew Transport

Vehicle] which the ESA is thinking of using from 2001 onwards to service the international "R-Alpha" orbiting station: with a diameter of 2.8 meters and a height of 2.4 meters, the ARD will be roughly as big as the Soyuz reentry module.

Developed with the participation of the Franco-British company Matra Marconi Space with respect to the functional electronics, and of German and Italian manufacturers (essentially Dasa and Alenia), the ARD capsule will make a suborbital flight lasting around 90 minutes. Although relatively short, it will nonetheless allow Europe to test all of the phases of a genuine mission to service an orbiting station: after taking off from the Kourou space center in Guyana, carried high in the nose cone of Ariane 5 (above a telecommunications satellite which the rocket will put into geostationary orbit during the same flight), the capsule will be released into space over the southern tip of Africa, immediately after extinction of the engine of its launch vehicle's central stage. Propelled by the thrust effect from the latter, it will climb to about 1,200 kilometers from ground level, far higher than the 350 to 400 kilometers currently achieved by the Russian Soyuz capsules when servicing the Mir station. The ARD will then fall towards the Pacific Ocean, where it will splash down some distance from the Chilean coast.

Protective Shield

For the engineers, the main lessons should be learned during the fifteen or so minutes when the capsule is reentering the atmosphere. The main aims of the flight will then be twofold, concerning on the one hand the way the capsule itself "holds up," and on the other hand the accuracy achieved in guiding it towards the scheduled splashdown point.

As far as its ruggedness is concerned, it is planned to carry out a detailed analysis of the aerothermal phenomena which occur during the crucial phase of reentry into the upper layers of the atmosphere, as well as of the effects of the notorious radio "blackout" to which the vehicle, which will have an aluminum structure, will be subject, and, of course, the effectiveness of the protective shield, which will be made of a silicone-impregnated silica fabric, while the capsule's rear cone will be made of cork powder and phenolic resin.

With respect to the guidance system, it will be necessary to evaluate the behavior of the reentry propulsion system (derived from Ariane 5's attitude control system) as well as the effectiveness of the descent system used: it will consist of three parachutes measuring 16 meters in diameter which should be steered so as to produce a landing accurate to around one kilometer. This would be a distinct improvement over what has been done to date: while the return of the Apollos which conquered the Moon was achieved within a radius in the order of 20 kilometers, the Soyuz cannot be guided with greater accuracy than around 10 kilometers...

If the operation is fully successful, a big step will have been taken towards the setting up of a real manned space transport system. On the condition, however, that the member countries of the ESA will first agree to supply the Fr20 billion or so which its realization will require. This program will in fact have to be the subject of a meeting of the European government ministers responsible for matters involving space, which is planned for the end of next year.

NEC SX-3R Supercomputer on Line at German Aerospace Research Establishment

94WS0356A Frankfurt/Main FRANKFURTER
RUNDSCHAU in German 30 Apr 94 p 22

[Article by Heidi Niemann: "Gigantic 'Superbrain' Expected to Build Aircraft of Future"—first paragraph is FRANKFURTER RUNDSCHAU introduction]

[Text] Goettingen, 29 April—Germany's fastest mainframe computer has gone into operation. The computer can perform 12.8 billion calculations per second.

The German Aerospace Research Institute (DLR) displayed Germany's fastest and most powerful mainframe computer in Goettingen on Friday. The head of the DLR Central Data Processing Division in Oberpfaffenhofen, Hans-Martin Wacker, put the NEC Corporation SX-3R supercomputer into operation following a test run lasting several months. The mainframe, which was installed in the DLR institute in Goettingen in September of last year, is one of the three fastest computers available in Europe. The "superbrain" can perform up to 12.8 billion calculations per second. Especially scientists who work in the fields of aerospace and traffic technology as well as climate research can carry out numerical simulations with the computer.

The "superbrain," which was installed on a 100-square-meter surface, consists of a puzzle-like set of metal boxes. The system includes, among other things, a main memory unit that has the enormous capacity of 1 gigabyte (a billion bytes) and numerous disk drives with a total capacity of 46 gigabytes. The most impressive thing about the mainframe is its speed. Access to the main memory unit takes 20 nanoseconds (20 times 10 to the power of -9 seconds).

The technical child prodigy is Japanese product. The DLR had also invited leading representatives of the NEC Corporation from Tokyo to the opening. As early as the beginning of September, 10 of the manufacturer's engineers came to Goettingen from Japan to install the computer comprising three truck loads at the DLR research center.

Those scientists in particular who work on extremely calculation-intensive tasks can benefit from the new mainframe. Even the most difficult numerical problems can be solved with the "superbrain." Thus designers of aerodynamic equipment, for example, can simulate the flow response of aircraft or individual airfoils on the

computer. Such enormous amounts of data can only be processed with this immensely rapid access to the main memory unit. But computer-controlled computational procedures are not only used in the calculations for and optimization of aerospace vehicles, but also in environment and climate research to, for example, obtain insights into the origins and dissemination of pollutants.

The enormous speed and capacity of the system are also apparent in the central unit, the so-called CPU (central processing unit). It has four so-called pipeline sets, each of which has four vector pipelines that operate at a total of 6.4 gigaflops, that is, 6.4 billion floating point operations per second. Andreas Landhaeusser, who is in charge of the DLR computer, illustrated its scarcely imaginable speed with an example: "If the entire population of the world were to add two numbers on a pocket calculator, the SX-3 would still be faster than all the people on this earth together."

ESA Restructures Programs

94WS0356B Bonn LUFT- UND RAUMFAHRT
in German No 1, Jan-Mar 94 pp 14-17

[Article: "Future of ESA With New Direction"—first paragraph is LUFT- UND RAUMFAHRT introduction]

[Text] The ESA's [European Space Agency] plans to participate in the international space station were called into question last year. It was not until January 1994 that they got around to restructuring the ESA space program. It was, to be sure, clearly reduced, but it at least affords industry new security in planning.

The decisions reached by the conference of ESA ministers in Granada at the end of 1992 concerning the major European space programs wound up in the wastepaper basket only a few months later. The mounting budget problems of the governments concerned, but also the first bilateral agreement between the United States and Russia on cooperation, had forced the ESA to basically restructure its plans.

After lengthy negotiations, in Paris on 15 February the ESA Council was able to reach agreement on new plans. On this basis, the MSTP (Manned Space Transportation Program) and Columbus programs can now be tackled as European contributions to the international space station. The program now includes a crew transfer vehicle (CTV), a manned, automated transfer vehicle (ATV), and an orbital Columbus element, all of which are to be launched with the new Ariane 5 carrier rocket. In addition, joint space flights with Russia (Euromir) and the United States are planned. How cooperation with the United States and Russia on the development, construction, and operation of a common international space station will look in detail cannot yet be foreseen. The ESA Council has only confirmed its determination to take part in negotiations with all the parties to the venture.

There were lengthy discussions as to whether the hitherto separate Columbus and MSTP programs should be combined. It has now been decided that a single management structure will be responsible for the execution of this program as of March 1994. For 1994 and 1995, 203 million RE (1 RE = 1 ECU) were released to finance the MSTP and 267 million RE for Columbus. But only studies and advance developments are to be implemented with these funds initially until the decision is made at a conference of ESA ministers in 1995 as to whether these elements will actually be built.

The extent of the financing for these is about 60-percent less than the amounts planned for them in Granada in 1992. This means about 120 million German marks [DM] for 1994 and about DM140 million for 1995 for the German contribution to manned space transport. By and large, the Ministry for Research and Technology's (BMFT) ESA budget was slightly reduced for the first time in 1994. The BMFT informed us that, after the high growth rates of the past few years, which had led to a doubling [of the ESA budget], the ESA contribution of more than DM1.092 billion originally planned for 1994 could no longer be justified. Additional cuts are probably no longer planned, but upward adjustments are just as little expected.

At any rate, a certain security as concerns planning has set in with this restructuring. The ESA believes that the new program not only takes into account the financial obligations of the participating states, but also contains elements that are consistent among themselves and which can be adapted to altered basic conditions. The ESA thinks that these elements are unique in a framework of cooperation, will be utilizable very early on, and are compatible with a long-term view of the situation.

The now combined MSTP program for manned space transport makes it possible to transport persons to and from space stations, to keep them supplied and remove their waste products, for humans and robots to perform outboard repairs and maintenance on space vehicles and stations, as well as to later organize program elements in terms of long-term objectives like, for example, moon missions.

The CTV is a transport vehicle designed to be used as a return capsule which can be launched with Ariane 5. With a total mass of 18 tons, four passengers and 400 kg of payload can be transported into orbit and back in addition to a payload of 1 ton from earth into space. The design permits a certain amount of aerodynamic maneuverability (lateral range), from 200 to 500 km. It can be landed with parachute with a maximal degree of accuracy of 9 km. Water landings are also possible. According to ESA plans, a first demonstration flight (manned or unmanned) could be made by 2001, a second (manned) flight by 2002, and regular operation after that. At any rate, some technologies that have already been developed for the Hermes program would be usable for the CTV. Among these are problems involving aerothermodynamics, flight path calculations, thermal balance,

materials, onboard systems, and testing procedures. But navigation problems must be studied again since the CTV is supposed to fly automatically; that is, none of the passengers need be trained as pilots.

The ATV is also supposed to be launched with Ariane 5 and to convey space station elements, or payload modules with a mass of up to 14 tons, to space stations in a lower orbit as well as serving to remove waste from space stations. The ATV will carry out an automatic rendezvous and docking maneuver and can remain docked at the space station for up to six months. Since the ATV will serve to remove spent fuel waste from space stations and burn out during reentry, the possibility of landing it has not been allowed for. The first flight could be made in 1999 with regular operation as of the year 2000.

Along with both of these vehicles, the CTV and the ATV, a European robot arm is expected to be developed within the framework of the MSTP. It should be ready for use as of 1999 as well as a space suit for outboard use, as already provided for in the earlier plans. A demonstration flight is planned for 1998.

The BMFT believes that a new basis for manned space flight could be created in Europe with these elements. From today's standpoint, these in their time "overly ambitious programs" are now grounded on a viable financial basis, technological continuity is ensured, and the opportunity to participate in global cooperation is preserved. The BMFT says that Europe has now attained freedom of design in view of our point in time and organization of its contribution to the space station.

But it is also important for us now to achieve closer European solidarity. The earlier ESA Hermes and Columbus programs were marked by a clash of interests between France and Germany. Now the European contribution to the global space station will be "decisively stabilized" by the merger of transport and station programs.

Above all, this merger did not go undisputed during the final phase of the negotiations. But, alongside the decisions on manned spaceflight, the ESA Council made a few more important decisions that contribute to the safeguarding of industrial capacities. Thus for the user programs such as, for example, for earth observation, telecommunications, and MIR [Russian Space Station] missions, we Germans are to contribute about DM1.3 billion, about DM1 billion of which will be available by the year 2000. The ESA Council has confirmed that the earth observation programs, Envisat and Polar Platform, will also be combined into a single management structure.

European Rocket Engine Makers Unite to Develop Improved Propulsion Systems

94WS0356C Duesseldorf *HANDELSBLATT* in German
13-14 May 94 p 19

[Article by HS: "Ariane 5 Has Great Potential; Five Leading European Engine Makers Plan Development Beyond 2015"]

[Text] Bonn, Thursday, 12 May—The European space industry is not allowing itself to be disheartened by the current budget cuts. The leading European rocket engine manufacturers—German Aerospace (DASA), Fiat Avio, SEP (European Propellant Company), Techspace Aero, and Volvo Aircraft Engines, Inc.—have signed an agreement that is expected to ensure the development of high-performance engine systems beyond the year 2015. The regular workforce of experienced workers is expected to continue to be motivated and their valuable know-how to be safeguarded.

Before the German-French Society for Science and Technology in Bonn, Roger Vignelles, the chief executive officer of SEP, and Werner Inden, a member of the board of DASA/Erno Space Technology, Ltd., in Bremen, seemed to be optimistic that Europe's space industry could hold its own against the competition from the United States, Russia, China, and Japan in future as well.

Rocket engines are a specific branch of the high-tech industry. This is why the experiences amassed and top performance obtained in this field over the past 20 years could not have been preserved and developed with activities in other fields. Moreover, while it takes a very long time to develop rockets and their core, the propulsion system, they also have a very long operational life. This is why we had to set our course for need-oriented developments early on.

In the opinion of the five rocket engine manufacturers, we can count on the following developments in the economic-technical domain over the next 10 years: an increase in rocket payloads for the purpose of transporting heavy geostationary telecommunications satellites, intensification of earth observation, more science satellites, the development of satellites weighing from 0.5 to 1 ton for low orbits, a demand for military reconnaissance satellites in Europe too, and a European contribution to the development of a manned space station. In the additional 10 years until 2015 we may count on Europe's participation in the operation of a space station and, furthermore, on manned space transportation as well as round trips to the moon.

In the field of telecommunications the number of satellite positionings will, to be sure, stagnate, but the payload of a carrier will increase every seven years by from 800 to 1,000 kg and this will happen despite the huge increase in carrier capacities as a result of further miniaturization.

After 2015 we can count on drastic cost reductions in space transport with completely new fields of application to solve mankind's global problems. The catchphrases with regard to this are, among others: solar energy from space and (wireless) transmission of same to the earth, the alleviation or solution of the ozone problem, and the transporting of the rare gas, helium, from the moon to the earth. A solar station in outer space with an output of 10 gigawatts (as much as eight

Biblis-type nuclear power plants produce) will also presuppose an entirely new infrastructure on the earth. Furthermore, reusable rocket engines will have to be developed. But first the development of large (light-weight) structures will also still have to be mastered. The development of closed life (survival) systems for longer space missions will be an enormous task.

In the opinion of the rocket engine makers, the Ariane 5, the basic development program for which will be completed in 1995, still absolutely has the potential for improvement as concerns cost reduction, only, however, to a maximum of about 10 percent. Greater savings beyond this can only be achieved through new, reusable equipment. Moreover, the U.S. shuttle is not de facto a really reusable piece of equipment.

At the present time the engine manufacturers are thinking of developing a small engine for a reusable "demonstrator" weighing from 10 to 15 tons in order to "familiarize themselves with the technological requirements." In connection with this, the Europeans are said to have negotiated with the Russians to let them have the appropriate (very advanced) know-how for the attractive price of 40 million German marks.

In the industry's opinion, the competition in the commercial space industry—especially for the positioning of telecommunications satellites—will be tougher in the near future than up to now between the European Ariane, the American Atlas 2AS, possibly a new U.S. development, and, furthermore, the Chinese "Long March," the Japanese H2, and the Russian Proton. However, the experts acknowledge that the design for the Ariane 5 presented in 1984 represents the best combination of performance, cost, and reliability.

Germany: Joint European Cooperation in Turboprop Development

94WS0371B Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 25 May 94 p 8

[Unattributed article: "The Euroflag Consortium Focuses on Propellers"]

[Text] London. The European Consortium, "Future Large Aircraft" (FLA), has now decided on turboprop propulsion for its heavy military air transport project. British Aerospace Corp., the FLA program partner in London, explained that jet propulsion had been rejected because considerable technical difficulties were anticipated in having the jet engines attain the short-takeoff capability required on undeveloped terrain.

A further consideration in the decision is that turboprop aircraft are cheaper to develop and produce. Moreover, modern turboprop aircraft can now fly just about as fast as jet aircraft. On the basis of current calculations, the FLA aircraft is expected to fly at a maximum cruising speed of 72 percent of the speed of sound (Mach). The

most advanced U.S. military transport aircraft, employing jet propulsion, fly at 77 percent the speed of sound.

Just a few months ago, it seemed certain that the FLA aircraft would be driven by jet engines. Several European companies had already proposed their engines for the planned aircraft, and for some time it seemed as though the future belonged to strictly jet propulsion.

In the second half of the 1980s, the U.S. aviation industry dropped plans for the construction of a turboprop commercial aircraft when the airlines decided against it on the grounds that the flying public were too accustomed to jet aircraft. Even the significantly lower specific fuel consumption of advanced turboprop engines could not alter the decision.

Two European consortia are already interested in building the turboprop engines for the FLA aircraft. One is the German-British BMW-Rolls Royce grouping, and the other is the Snecma (France), Fiat (Italy), and MTU (Germany) group.

Ratier-Figeac and Hispano Suiza of France and Dowty of Great Britain are interested in developing and producing the propellers. The main competitors of the planned FLA aircraft—the new An-70 from Ukraine and the Lockheed C130J from the United States—are likewise driven by turboprop engines.

Germany: ILA To Play Mediator Role Between East, West in Space Activities

94WS0371D Frankfurt/Main FRANKFURTER
ZEITUNG/BLICK DURCH DIE WIRTSCHAFT
in German 26 May 94 p 8

[Article by Wolfgang Engelhardt: "European Space Industry Waits for U.S. Decision on Space Station"]

[Text] Berlin. A number of well-known companies will be absent this year from the forthcoming ILA '94 International Aviation and Space Show, which will be held at the Schoenefeld Airfield in Berlin from 28 May through 5 June. After the withdrawal of German Aerospace, it will indeed be a small show. Other German and international exhibitors either do not want to enter the show or have now withdrawn. Only the space industry will be present in Berlin in the measure it had originally planned. For that reason, the space exhibits will have the most appeal for the 250,000 exhibit visitors expected.

The main attraction for ILA guests interested in satellites and rocket projects will certainly be Hall C, where the European Space Agency (ESA) and the German Space Agency (DARA) will exhibit their most important and successful applications—and research satellites as well as the most successful booster rockets in the world—the Arianes.

The fascination of space is brought closer to the visitors in an extravagant "holorama" show. Through the new

technique of "virtual reality" simulations, the visitors will be able to experience a space trip to Mars and Jupiter. Talks, conferences, and discussions by and with space experts will be held daily in the forum of Hall C.

The decision as to whether Ulf Merbold or the Spaniard Pedro Duque is to be orbited by a Soyuz rocket and spend 30 days in the Mir space station this fall will also be announced in Berlin. Jean-Marie Luton, director general of ESA, will make the announcement on 30 May.

This year's manned space mission and a second ESA/Russian flight scheduled for 1995, for which Thomas Reiter and a second German astronaut are already in training and which is planned to last 130 days, are preparatory for the large international space station that is to be put into Earth orbit early in the 21st century by the Americans, Russians, Europeans, Japanese, and Canadians.

Unfortunately, that ambitious project, which will cost many billions of dollars, is not yet certain. The Congress of the United States is to vote on it in June, and the "Freedom" or "Alpha" station may or may not become a reality. The justification for this project has shifted from the purely technical/scientific gains to be had to the political benefits this major multinational project would have for future relations between peoples and states.

The decision of the Americans vis a vis the space station is awaited with considerable anxiety in Europe because decisions related to it have had to be altered and postponed many times already. It is still expected that ESA, under the overall control of Germany, will develop a laboratory module for weightlessness studies; the module will be docked permanently with the space station.

Should the United States actually withdraw from the project, Europe could perhaps link the station module up to the Russian Mir-2 complex, which is scheduled to be put in Earth orbit in the late 1990s. In general, however, all European decisions as to their manned space projects are currently on hold, and will remain so until a final decision is taken on the large space station.

Probably the research ministers of the participating ESA states will not meet in Paris until late 1995 to discuss their further actions. The same situation also holds with respect to the decision on a European astronaut transport vehicle, by means of which technicians and researchers will be able to fly from Earth to and from space stations. After finally dropping the Hermes vehicle, which had become too heavy and too expensive, plans are now being developed for a less expensive, conventional astronaut capsule capable of transporting the four crew members and a ton of cargo to and from orbit.

Exhibited at ILA '94 will be the first designs and models of this capsule, which will be launched by the new European Ariane-5 rocket, which is near readiness. Certainly, Germany's commitment to manned space

projects will be an issue in the many conferences and presentations. After numerous controversies, the public debate about that issue has notably subsided for the time being, at least until final decisions and money appropriations for the Columbus and astronaut capsule have to be made.

Studies now underway concerning these manned space projects are—for the time being at least—being supported by Germany in the ESA budget to the tune of 100 million German marks [DM] per year. That amount represents only about 6 percent of the total space budget contained in the overall budget of the Federal Ministry of Research.

Meanwhile, countless managers, politicians, scientists, and technicians involved in the space industry in both West and East Europe are taking advantage of the ILA in Berlin, especially for intensive talks about, for example, how cooperation with Russia might be strengthened. Precisely in this matter, our country can provide an enormous amount of technical potential and know-how in any future cooperative ventures. This new East-West mediator role played by the German aviation and space fair can—with time—become increasingly more important, thereby ensuring that ILA will continue functioning in that role in the coming years.

Germany: DASA Develops Silicon Photocells With 25-Percent Efficiency

BR1306143194 Paris AFP SCIENCES in French
11 May 94 p 7

[Unattributed article: "Photocells Show Record 25-Percent Output"]

[Text] European manufacturers have just developed silicon photocells with a record 25-percent output, destined to be used in future deep space missions but also in low earth orbit as well as for purely terrestrial applications, the ESA [European Space Agency] announced on April 29.

This output, obtained using silicon elements measuring six by four cm at low temperatures and under low-light conditions, is the "highest output ever obtained anywhere in the world using silicon batteries without using special optical concentration devices to increase the quantity of sunlight being converted into electricity." This technical breakthrough was made by an industrial team led by DASA [German Aerospace], with CISE [Center for Data, Studies, and Experimentation] (Milan, Italy) as subcontractor.

The photocells currently in use in all space activities provide an output of 10 to 20 percent in low-earth orbit and behave abnormally in deep space conditions. In general, they are not designed to function at temperatures as low as those encountered in that environment.

In these difficult conditions, space probes have to draw on energy sources other than their solar panels, whose

electricity output becomes too weak. Hitherto, probes launched into deep space have used thermonuclear generators such as the RIG [Radio-Isotope Thermoelectric Generator]. However, RIG technology is not available in Europe; for this reason ESA has been working hard to produce an energy source based on very high output photocells. Just under a year ago, the agency had already achieved an output of 23 percent with gallium arsenide (GaAs) elements.

Finland Builds First Satellite Prototype

94WS0360A Helsinki HUFVUDSTADSBLADET
in Swedish 30 Apr 94 p 3

[Article by Patricia Winckelmann-Zilliacus: "Prototype for Finland's First Satellite Ready"]

[Text] The aerospace technology laboratory at the Technical University is well on its way toward constructing and building Finland's first satellite. It involves a microsatellite which, according to preliminary plans, will be launched in 1998 with the European launch rocket Ariane 4.

The microsatellite, which is called HUTSAT (Helsinki University of Technology Satellite), already exists in the form of a prototype which at the moment is on public display, hanging from the ceiling of the Heureka Science Center in Vanda.

"The prototype is the first phase of the project. Now we will conduct negotiations with our financial backers, the Technical University and Finland's Academy, regarding resources for phase number two. It involves 10 million markka and the resources will be used to build the final satellite construction, the fuselage, fuselage parts and the facilities, as well as to obtain space on board the A 4 launch rocket, says Dr. of Engineering Matti Brax, head of the project group.

HUTSAT is a microsatellite which weighs 50 kg. Its size is reminiscent of a traditional television set. The popularity of microsatellites around the world has increased in recent years, due to the development of microelectronics. Nowadays, complicated measuring instruments can be built so small that satellites weighing 1,000 kg are not needed for transporting them in space.

Space Research

Satellites are generally used in order to measure and record phenomena in space, chart the surface of the earth or link telecommunications. The Finnish satellite is to carry out space research. The measuring instruments, which are built into the satellite, will measure the earth's magnetic field and radiation in space.

However, the most important objective for the satellite project is to train Finnish space engineers and develop research in the field. This type of know-how increases the

ability of Finnish companies to compete for international space projects. In 1995 Finland will become a member of the European space organization ESA.

Matti Brax points out that Finland already has companies which are competitive regarding orders for various space projects. He mentions, among others, Vaisala, Outokumpu and Finnyards.

"What is technically demanding with space satellites is that all electronics built into the satellite must require extremely little energy. The satellite has a low electrical output, only 30 watts, since the surface of the solar panel is very small. The satellite should also be very durable, since it cannot be repaired. We have estimated that it should last for two years," says Dr. of Engineering Juha-Pekka Luntama, one of the participants in the project group.

He says that the launch is also a critical phase for the satellites. One reason is that the parts are subjected to considerable shaking when the launch rocket takes off. Even the loud noise can cause satellite parts to come off.

Space on Ariane 4?

"England is the country that has come farthest in micro-satellite technology. Finland is approximately at the same level as Denmark and Israel. These countries are also planning to launch their first microsatellites," says Matti Brax.

A launch rocket can transport 4-6 microsatellites. The launch rocket Ariane 4, on which it is hoped that the Finnish satellite will be able to reserve space, will be launched in 1998 from the European space agency ESA's space center at Kourou, which is located in French Guyana in South America. When the launch rocket reaches the correct orbit, the microsatellites are released by means of explosive bolts. The orbit for the microsatellites launched at that time is a course that takes them over the North and South Poles.

AUTOMOTIVE INDUSTRY

France: PSA, Fiat Automobile Plant Inaugurated

Merger's Antecedents

94WS0361A Paris LE MONDE in French 17 May 94 p 21

[Article entitled: "PSA and Fiat to Jointly Produce a Direct Competitor to Renault's Espace"; first paragraph is LE MONDE introduction]

[Text] Gerard Longuet, minister of industry, postal services and telecommunications, and foreign trade; Jacques Calvet, CEO of PSA Peugeot-Citroen; and Giorgio Garuzzo, general director of Fiat Spa, were scheduled to inaugurate the new factory the Sochalian group built with Fiat on Monday, 16 May. The plant is located in the north, in Hordain-Lieu Saint-Amand near Valenciennes,

where the two automakers will jointly manufacture a new minivan to compete directly with the current top seller in Europe, Renault's Espace.

It is not the first joint outing for PSA Peugeot-Citroen and Fiat, who have been collaborating for 15 years. Indeed, their first venture was in June of 1978, when the French and Italian automakers decided to produce a utility vehicle able to carry 800 to 1,800 kilos of freight. They formed a joint company, Sevel Spa (European Light Vehicle Co.), which was held 25 percent by Automobiles Peugeot, 25 percent by Automobiles Citroen, and 50 percent by Fiat Auto. Located in Italy, in Val di Sangro near Pescara, the factory produces Peugeot's current Boxers, Citroen's Jumpers, and Fiat's new Ducato, which is now being marketed.

Ten years later, in December of 1988, the two automakers decided to repeat their first adventure. They agreed to study the industrialization and production of a minivan to compete directly with Renault's Espace, which already dominates the highly lucrative market segment of minivans. At that point the partners decided to construct an entirely new factory, to be called "Sevelnord," in Hordain-Lieu Saint-Amand, between Valenciennes and Cambrai in the north. The two partners are splitting capital, expenses, and responsibility exactly as they did in Italy (25 percent Peugeot, 25 percent Citroen, and 50 percent Fiat). Work began in 1990. It will end on Monday, 16 June, when a plant costing 6.5 billion French francs [Fr] and expected to employ 3,500 people by late 1995 is inaugurated.

Four Brands, Four Names

Indeed, Sevelnord's 230,000 square meters were designed to manufacture 120-130,000 vehicles a year at full capacity. The minivans will be sold under four different brands and names: Peugeot 806, Citroen Evasion, Fiat Ulysse, and Lancia Z (Zeta). The various models, which were presented at the last Geneva Show (see LE MONDE, 14 January), required an investment of Fr4 billion, and are virtually identical, save a few details such as radiator grills and headlights.

Sevelnord is both an industrial and commercial gamble in a market whose growth has slowed. It is also a gamble for the Nord-Pas-de-Calais region, which is on its way to becoming a rust belt. The plant, whose promoters liked to refer to it as "the biggest industrial project underway in France" during its construction, is being introduced in an area devastated by unemployment (see LE MONDE, 29 November, 1992). Ten thousand people applied to work at the factory.

PSA Peugeot-Citroen, which voluntarily limited its use of robots, must have taken that social reality into consideration. Robots will handle only 50 percent of sheet metal operations, compared to 85 percent in other plants of the French group. PSA Peugeot-Citroen has also decided to organize production to make it cheaper, simpler, and better adapted to manual labor. A true sign of the times...

[[Boxed Material]]:

The Minivan War to Heat Up

It was 10 years ago, in 1984, that Renault and Matra sent a totally novel type of vehicle, a sort of minibus with the look of a high-class automobile, out onto French roads. Chrysler had floated the design a year earlier in North America. France's "Espace" and America's "Voyager" gave birth to the minivan concept. Espace's first victory was to win over companies and reconcile high-ranking executives to carpooling. Where motor-coaches—even small, metallically painted ones—inevitably evoked summer camp, buses full of sports fans, or cheap tours, where the CombiVolkswagen-style minibuses of the time suffered from identification with partying bands of hippies, the "minivan" seemed an essential accouterment to society's managers. It was modern, tasteful, and as comfortable as a high-speed-train car. Gradually the minivan also conquered the well-off professional class, hysterical, as summer approached, at the thought of journeying across France with a noisy load of offspring packed into the back of an overheated sedan.

As a result, the minivan—the only real automobile innovation in the last decade—has become a model every good automaker must offer. Top of the line (the base price is about 120,000 French francs [Fr]) and high margin, minivans are an essential niche in an economic climate that makes selling ordinary models tricky. Minivans account for about 1.2 percent of total automobile sales in Europe. The number sold doubled in three years from a 1989 level of 60,000, then jumped to 150,000 in 1993. And even if growth does slow a bit, PSA says the European market should top the 400,000 mark by 1998.

France remains the market leader in Europe (28.5 percent of sales), followed by Germany (21 percent), and Great Britain (9.6 percent). Renault is still top dog on the continent (44 percent of sales in 1992), ahead of Chrysler (17 percent). But competition is heating up: Mitsubishi has launched its Space Wagon, Nissan its Serena model, Pontiac (GM) its Transport, and Toyota its Previa. Starting next month, PSA and Citroen are going to add their own model offered under the four brand names Peugeot, Citroen, Fiat, and Lancia. Ford and Volkswagen will bring out their joint model, made in Portugal, next year.

New Venture Profiled

94WS0361B Paris LE MONDE in French 18 May 94
p 23

[Article by Lille correspondent Jean-Rene Lore: "PSA-Fiat's New Factory Will Employ 3,500 in 1995"; first paragraph is LE MONDE introduction]

[Text] PSA Peugeot-Citroen CEO Jacques Calvet emphasized the exemplary nature of the "first big auto plant built in France in 20 years" when he inaugurated the facility, dubbed Sevelnord, in Hordain, near Valenciennes in the north, on Monday, 16 May. The minister of

industry, Gerard Longuet, and Giorgio Garruzzo, general director of Fiat Spa, attended. The plant, said Calvet, is "a success that could serve as a model to all of France, particularly industrial France." In a region hard hit by unemployment, the new factory will employ 3,500 by the end of 1995.

Sevelnord, which is a joint PSA Peugeot-Citroen/Fiat venture, will make minivans competing directly with Renault's Espace and marketed under the names Peugeot 806, Citroen Evasion, Fiat Ulysse, and Lancia Zeta. The joint factory, the biggest auto plant built in France in 20 years, will employ 3,500 by the end of 1995 and will produce 130,000 vehicles annually (see LE MONDE, 17 May). The two partners split the cost of the Fr6 billion investment, for which they received, stressed Calvet, only modest assistance (Fr250 million for regional development and a business tax exemption through 1998).

Picking up a thread started by Sevelnord director Roger Garnier, who described the "first big auto plant built in France for 20 years" as a move to defy the trend toward sending manufacturing work overseas, Calvet excoriated "the abominable Brussels Commission, which spurred European manufacturers to relocate offshore." He insisted during a press conference that "the individual expertise and combined technologies required, as well as the importance of auto manufacturing to our gross domestic products, make it an industry in which big industrialized countries must invest."

The Subsidiarity Principle

PSA Peugeot-Citroen's CEO also reiterated his confidence in "occasional collaborative ventures" rather than "total mergers." In so doing, he offered his own version of the subsidiarity principle, whereby "[partners] do together what each cannot do alone, which," to the contrary, "means they do not do together what each one can do alone." To stay competitive in the promising minivan niche, Peugeot therefore opted to team up with Fiat on what is still a very cautious undertaking. "We were careful not to push up the cost of equipment," said Calvet, commenting on the "attempt to find a better balance between automation and manual work." Sevelnord did not opt either for full robotization or full automation, preferring to keep the flexibility offered by wage earners. "We are not exempt from the effects of a market turnaround," he explains.

Yet Sevelnord is clearly a modern factory. Though robots are in evidence only where they are more suitable than people (measurement checks, difficult or laborious tasks), the whole production line is computerized, making it possible to customize the handling of each vehicle. The goal is to manufacture on demand, to adhere more closely to customer needs.

Moreover, Longuet hailed the Sevelnord "smart plant" as a way of responding to the contradictory dual

demands of "market segmentation and internationalization." The first calls for flexibility, while the second requires collaboration.

[Boxed Material]:

Record Hiring by Industry

With 3,500 new jobs projected by the end of 1995 (current staffing is 2,000), PSA-Fiat's Sevelnord factory easily ranks first among investments that have created industrial jobs over the last five years. It is obviously the top investment in the auto industry, since it is the first new car plant since Citroen-Aulnay built one 20 years ago. More generally, however, none of the big factories built in any sector since 1990 has generated more than 1,000 jobs.

Whether you look at Aluminium Pechiney's electrolysis plant in Dunkerque (550 jobs) or Coca-Cola's factory in the same region (200), all fall under the 1,000 mark. Holland's Philips, which set up shop in Caen, created 300 jobs with its computer board factory, while the computer peripherals plant built by the U.S.'s StorageTek in Toulouse initially projected 400 jobs.

Hewlett-Packard subcontractor SCI set up a new site (900 jobs) near Grenoble. Daewoo's plant in Lorraine was the top job-creator until now, with a thousand new positions.

Germany: Hydrogen Fuel Cell Developed for Zero-Emission Vehicle

94WS0335A Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 15 Apr 94 p 8

[Text] Ulm (Reuter)—The Daimler-Benz AG company has introduced a vehicle which they say is the first to run on a hydrogen fuel cell. Research head Hartmut Weule said in Ulm that the new motor could "become the greatest innovation for drive technology in the next century." The transport vehicle fueled by hydrogen is said to be a "true zero emission vehicle." He said that no exhaust gases were created in driving, nothing but water. However, Daimler-Benz does not think that it will be ready for production for 10 years. In this motor, electrical energy is produced in a chemical reaction between hydrogen and oxygen in so-called "cold combustion." But the size, weight and price of the drive unit are still making problems for Daimler project leader Werner Tillmetz.

In the experimental vehicle the 800-kg engine filled the entire load area. In addition, the technology is said to cost 15,000 German marks per kilowatt of power. According to Tillmetz, the next version of the drive, planned for 1996, will only be an eighth as big and weigh 200 kg.

Daimler says that the development of the drive has cost them an amount in the hundreds of millions so far. The German fuel cell researchers are collaborating with the

Canadian specialists from Ballard Power Systems in Vancouver in its development.

Germany: Electric Superdrive Enhances Hybrid Vehicle Propulsion

94WS0335C Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 20 Apr 94 p 8

[Text] Frankfurt. Starting in 1998 the Schweinfurt company Fichtel & Sachs will produce the "Sachs Electric Superdrive" in bulk. This is a production-line hybrid vehicle which dispenses with the usual electric motors and their components, unlike vehicles with parallel drive train, because Sachs believes that they are too heavy and take up too much room.

In the "superdrive" the clutch, gears, camshaft, and differential are replaced by a generator, a tandem gear motor and its attendant power electronics. During a long-distance trip a normal combustion engine supplies the wheel drive with current via the generator and charges the battery. For exhaust-free city driving the system switches over to battery power, which can take the car about 50 kilometers.

Fichtel & Sachs promises power figures suitable for automobile travel, high efficiency, low weight and a small construction volume. They say that a tandem motor combines two electric motors, of which each will drive a wheel on one axle. So far an Audi 100 2.3 E Quattro has served as a test automobile; it has a 100-kilowatt generator which provides a tandem motor with a current of 50 kilowatts on each axle. Now tandem motors with integrated drives are being developed in cooperation with the drive manufacturers Lohmann & Stolterfoth, who also belong to the Mannesmann group. This should make the drive assembly for future hybrid vehicles even more compact.

Germany: Hybrid Vehicles Combine Advantages of Electric and Internal Combustion Engines

94WS0318A Berlin INGENIEUR DIGEST in German, Apr 94 pp 20-21

[Article by Guenther Ludwik: "Autonomous Hybrids"]

[Text] The hybrid drive combines the cleanliness of an electric motor and the mobility of a combustion engine. However, series production is still far away.

The principle is easily understood: The conventional combustion engine is engaged for driving under conditions where it operates optimally in terms of fuel consumption and environmental protection, and at the same time will charge the battery. The electric motor is engaged when the combustion engine would run at a low efficiency and thus harmfully to the environment. This is the case when only little driving power is required as, for instance, in city traffic or in a stop-and-go situation

particularly often encountered in the inner city, where emission of pollutants and noise needs to be avoided.

This idea is not new, but there are still stumbling blocks along the way to its practical realization. The optimum configuration is being sought. In order to approach this goal, the German Research Association has established a new special research program, "Autonomous Hybrid Drive Set," at the Technical University in Munich.

"By a simulation process we want to develop a model and with that configuration then build a prototype," explains Prof Dr Bernd-Robert Hoehn. "Conventional drive components must be optimized for this special application. Stepless transmissions and regulators must be designed from scratch and tested. These components will, however, be usable not only in a future hybrid vehicle but also in conventional ones and in electric ones as well."

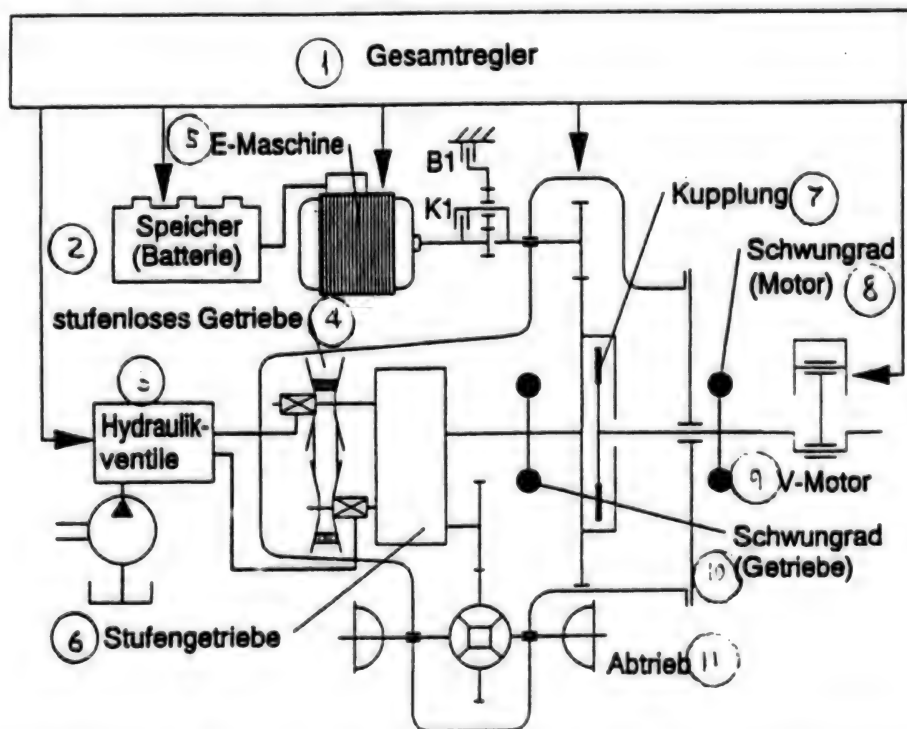
The concept of an autonomous hybrid is explained by the basic diagram on page 20 [shown below]: The axle is driven by either the combustion engine or the electric machine operating as a motor, through a common stepless mechanical transmission featuring a wide range of speed ratios. When operating as a motor the electric machine draws energy from the battery, in turn charging the battery when it operates as a generator during light-load or slow-traffic conditions while the combustion engine is engaged. Boosting the battery charge is possible but not required

during normal operation. An appropriately designed transmission makes it feasible to engage the combustion engine throughout its most fuel-favorable operating range and outside this range to use a high-speed and thus light-weight electric machine delivering full power over a wide speed range.

Further advantages are:

1. Use of smaller combustion engines is made feasible by higher start-up transmission ratios.
2. Use of smaller and lighter batteries is made feasible by autonomous recharging.
3. There is no need for a lighting generator and a starter.
4. The fuel saving in the ECE cycle is about 40 percent and emission of pollutants can be drastically minimized.
5. Noise emission is reduced owing to lower engine speed and wide overdrive range.

Among electric motors for hybrid vehicles, permanent-magnet (PM) motors have recently been found to offer great promise. The advantage of using them in vehicles lies in lossless maintenance of the magnetic flux. A breakthrough in required high-performance magnetic materials came about with the appearance of rare-earth magnets, Sm-Co in the nineteen seventies and Nd-Fe-B in the nineteen eighties.



Key: -1. all-including regulation system, 2. storage battery, 3. hydraulic valves, 4. stepless transmission, 5. electric (E) machine, 6. gear transmission, 7. coupling, 8. flywheel (for combustion engine) 9. combustion engine, 10. flywheel (for transmissions), 11. driven shaft

"The previously high costs pose no problem today. Thus Nd-Fe-B magnets for mass products are now purchased at a price also acceptable for vehicles," believes Prof Sture Eriksson of the ASEA Brown Boveri (ABB) Automation and Drives [ASEA—Swedish General Electric Co]. "Drives with PM motors cost about 15 percent more than comparable ones with induction motors. For that, however, in test runs they indicate an about 15-percent-longer travel range.

Both the ASEA Brown Boveri (ABB) AG and the Bayerische Motorenwerke (BMW) AG got together with the U.S. engine manufacturer Unique Mobility for further development of this technology. Prototype engines were already tested in BMW's experimental vehicles. The engine shown on page 21 [not reproduced] is coupled through a speed reducer to a transmission axle unit. The tests verify that drive systems with PM synchronous motors, while certainly not the only candidates for electric vehicles, are probably the high-performance "number one" for this application.

Since several years ago the research departments of the large automobile manufacturers have already been looking for the ideal configuration. Electric motors were coupled to gasoline and Diesel engines, even to gas turbines (Volvo ECC-ID 3/93, S.38/39). All designs to date have one thing in common: they are by far not ready for mass production. Thus even the second generation of the BMW E1 will not likely be produced in its present form, if at all. Also the Mitsubishi people have crammed so many innovations into its first hybrid research vehicle ESR (Ecological Science Research) that their study of it just shows what would be technically feasible if only the production cost could be to a reasonable level. The ESR concept is based on the series hybrid system, which means an exclusively electric drive. The four-cylinder tandem gasoline engine with 1.5-liter-capacity has a turbogenerator. Fuel is supposed to spare also the mufflerless exhaust system, electronically controlled counternoise compensating the exhaust noise. Body structure along with exterior and interior designs are setting standards.

Closer to practical implementation is the Ford design. Its drive consists of a 1,2-1 2-stroke 3-cylinder engine (60 kW = 82 hp), an electric induction motor (40 kW = 54 hp), and a Ni-Cd battery (40 kW, 7 kWh) weighing 200 kg. When mounted in an Escort Turnier, the system accelerates from standstill to 100 km/h within 10.9 s and in the electric drive mode to 50 km/h within 6.8 s. Driving at speeds up to 65 km/h is emission-free, the combustion engine automatically cutting in for higher speeds. Both sets together provide a power of 100 kW.

The questions remain as to whether there is at all a demand for such cars and how much they would cost. The results of a survey commissioned by Opel and covering 3000 car drivers indicate that 95 percent would buy a hybrid vehicle and 45 percent would pay 20,000 German marks for it. A top speed of 100 km/h satisfies 55 percent and a 200-km-long travel distance without

recharging is adequate for 48 percent of them. These are interesting data to be included in the specification sheets for engineers.

Germany: Service Robots Featured at Hannover Trade Fair

94WS0318B Berlin *INGENIEUR DIGEST* in German, Apr 94 pp 27-29]

[Article by LUK: "Service Provided By Robot"]

[Text] Industry expects the '94 Hannover Trade Fair 20-27 April to send signals as to whether the hoped-for upward economic trend has finally arrived. Meanwhile the automation sector is looking for new markets. Example: At this largest in the world industrial fair the future market for service robots will attend the opening show.

All the 6,600 exhibitors and about 350,000 expected visitors see in Hannover a mirror image of the world market. The key items on display this year are about 250 exhibits of assembly and handling robots which include industrial ones, over 670 material flow technology and logistics (CeMAT) exhibits, about 100 compressed-air technology exhibits covering tools and plant equipment, and 420 surface treatment exhibits. In a special exhibit, first organized in Halle 17, are displayed service robots.

Modern assembly and handling technology boosts the competitiveness of the customer. Integration of sensors and electronics, as well as of image and data processing in the assembly and handling technology, can also reduce the cost of small-scale production. The slogan "lean production" means not simpler or proven techniques but more automation and more flexibility within less intricate and easily monitored units.

"In 1992 the German MHI industry reached 3.9 billion German marks [DM] in sales against DM4.1 billion in the previous year," calculates Dr.-Eng. Hans Muno, business manager of the MHI Specialty Group in Frankfurt am Main and member of the German Machine and Plant Equipment Manufacturers (VDMA) Association. "Neither domestic nor export business saw any incentives in 1993, so that a further 5-7-percent decline in this market must be reckoned with."

Alongside assembly and handling robots, including industrial ones, there are shown building blocks and peripherals for complete MHI systems. According to VDMA estimates, this group made DM1.1 billion in sales. That corresponds to a 26-percent share of the total sales made by the robot industry.

Components and peripherals supplement assembly and handling facilities in formation of complete systems. Assembly and handling accounted each time for DM1.4 billion and thus 37 percent of the total sales. "In 1993 there is seen a distinct shift in their share of total sales," estimates Doctor Muno. Further development of the sensor, control, and guidance technologies leads to an

increasingly easier automation of intricate assembly processes. Assembly, components, and peripherals will assume a further increasing share, while handling has already been highly automated.

The share of about 200 mostly medium-size German MHI enterprises in exports is on the average 35 percent. The significance of European Union countries as their trade partners is clearly demonstrated by the example of service robots. Their export in 1992 amounted to DM181 million, 75 percent of it on the intracontinental market: Belgium, Luxembourg, and Italy with 18 percent being the three top ranking buyer countries followed by France with 15 percent.

Firms engaged in assembly and handling technologies depend on the economic position of their customers. This is how German machine manufacturing slid into the deepest recession in the last 40 years. The initially normal cyclic slowdown of the economy has been accelerated by the downhill trend which all other industrial nations including our trade partners are experiencing since 1992.

The decline in demand for machines in West Europe in 1993 was, according to Dr. Muno's figures, about 8 percent. The decrease of production amounted to only 5 percent, however, inasmuch as exports to North and Latin America, Asia, and East Europe increased.

The industry hopes that the recession in Europe will slowly come to an end. In a few countries it has already bottomed out, some other ones report even increases of machine

production. The German machine manufacturing industry counts on a slight, actual 2-percent, increase of production.

This will be in a large measure attributable to the overseas export, however, inasmuch as the West European demand for machines is expected to dry up. The same is true of domestic demand, as far as this one does not depend on export.

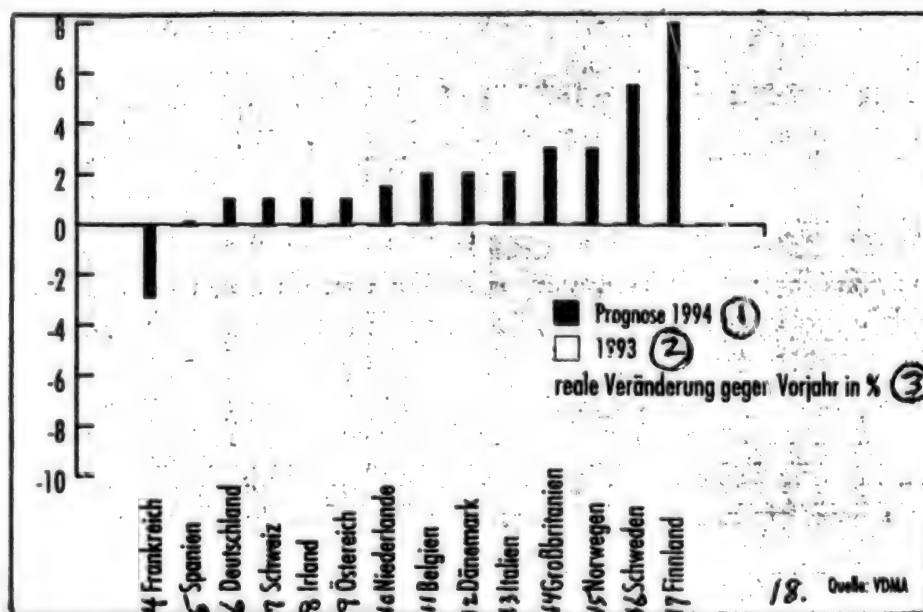
"The cyclic swing of the economy could possibly be overcome by 1995-1996," predicts Dr. Muno. "Machine manufacturing should be among the winners, not least because many enterprises have utilized the recession period for restructurization. They will emerge from this process much strengthened."

It is all the more important, therefore, to acknowledge internationally visible promising market segments by responding to them at the right time. Appropriate stimuli will be offered at the 25th International Symposium on Industrial Robots to be held on 25-27 April next to the exhibition site.

A special exhibit, "Service Robots Have Arrived," indicates a certain trend into the future. Their future market potential, according to expert estimates, is greater than that of already widely accepted industrial robots. Available prototypes and first series-produced units will convey an idea about coming developments of their service capabilities.

One service of undeniably great value and with correspondingly great market potential is cleaning: buildings,

Sales Made in West European Machine Manufacturing Sector



Key: 1. 1994 forecast, 2. 1993, 3. actual percentage change from previous year, 4. France, 5. Spain, 6. Germany, 7. Switzerland, 8. Ireland, 9. Austria, 10. Netherlands, 11. Belgium, 12. Denmark, 13. Italy, 14. Great Britain, 15. Norway, 16. Sweden, 17. Finland, 18. Source: VDMA

airplanes, and machines. Special-purpose walking monitor robots are offered for inspection tasks or rounds in industrial facilities, in museums, and in warehouses, also in places not accessible to a person, such as the inside of pipes and channels. Particularly in Europe, in Japan, and in the U.S. people are less fastidious, even though robots for health care services still encounter doubts or even rejection there when the question of replacing the human touch comes up. Potential customers there have, however, no acceptance problems. This is symbolized by the "Helpmate" service robot already operating in U.S. hospitals.

Germany: New Gas Turbine Concept Developed at ASEA Brown Boveri AG

94WS0318C Berlin INGENIEUR DIGEST in German, Apr 94 p 42

[Article by Oskar Vincenz: "Efficient Simplicity"]

[Translation] A fundamentally new gas turbine concept makes it feasible to improve the fuel utilization by about ten percent.

New concept: Significantly higher efficiency.

"With this concept the ASEA Brown Boveri (ABB) AG [ASEA—Swedish General Electric Co] becomes undoubtedly the global leader in gas turbine technology," hopes Dr Manfred Simon, member of the ABB board of directors in Mannheim: "The innovation can, without exaggeration, be described as a sensational one."

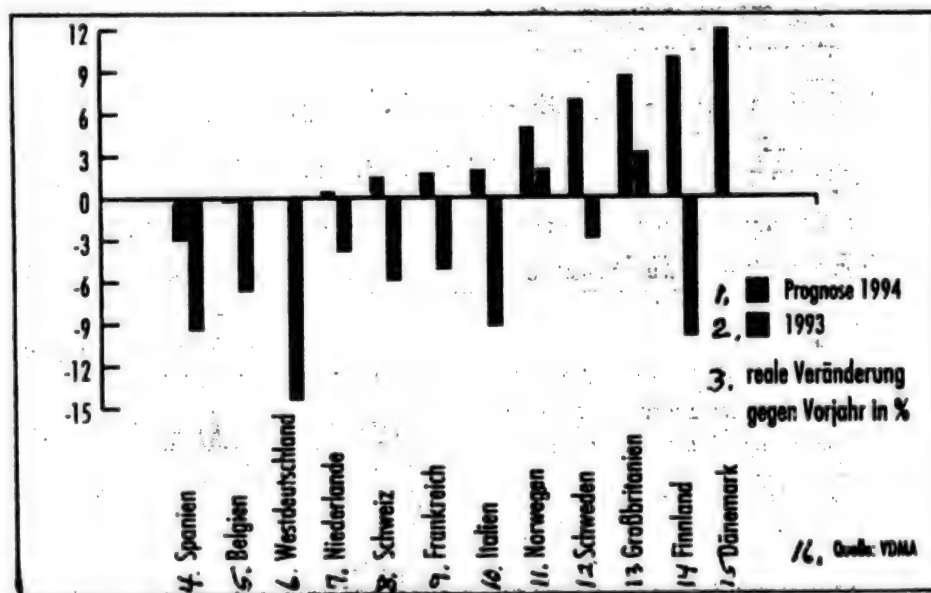
The new generation of gas turbines has remarkable characteristics: their thermal efficiency (ratio of engine output power to fuel input power) is almost 38 percent in the solo operation mode and the overall thermal efficiency of gas turbine + steam turbine set reaches 58 percent. When moreover heat is extracted for heating purposes, then the fuel utilization may be even 90-percent higher. With such a performance, then the two first engines of the new GT 26 series (for the 50 Hz market Europe and Asia) and GT 24 series (for American 60 Hz networks) are setting standards.

The new gas turbine concept has been developed by an international group of scientists and engineers from various ABB companies. Both new gas turbines, 240 kW and 165 kW respectively, convert energy with not only less fuel and at a lower but also with lower NO_x emission (below 25 ppm) and an excellent light-load performance. This technological leap was based on skillful selection of the process parameters for two-stage combustion. The result is a high specific power and a compact construction.

The key component of each gas turbine is the staged combustion chamber. The concept is both simple and efficient: such a combustion chamber utilizes the compressed air from the turbine not once but twice. Intermediate superheating is ensured by two premixer burners includes, one behind the other.

The annular first combustion chamber works with an unusually lean fuel-air mixture, the oxygen content being very high. About 60 percent of the incoming fuel is burnt here. Prior to combustion the air is compressed to a 30:1

Capital Outlays for Equipment



Key: 1. 1994 forecast, 2. 1993, 3. actual percentage change from previous year, 4. Spain, 5. Belgium, 6. West Germany, 7. Netherlands, 8. Switzerland, 9. France, 10. Italy, 11. Norway, 12. Sweden, 13. Great Britain, 14. Finland, 15. Denmark, 16. Source: VDMA

ratio in a compressor consisting of 22 optimally streamlined stages. In the burner, prior to ignition, the thus compressed air mixes with an exact fuel dose in an intense vortex stream.

The whirling of the fuel-air mixture through staggered conical burner half-shells is particularly intense. After ignition has taken place, the gaseous combustion products flow through a single-stage high-pressure turbine into the low-pressure combustion compartment. There, in the premixer burner, these still oxygen-rich gases mix thoroughly with the remaining 40 percent of the incoming fuel.

Owing to the simple construction of the annular combustion chamber, only a few of its parts are exposed to high temperatures. The uniform flame distribution prevents buildup of thermal stresses. A new heating power plant in Berlin-Center is to prove this.

Germany: Approximately DM3.8 Million Earmarked for Alternate Energy

94WS0318D Berlin INGENIEUR DIGEST in German, Apr 94 p 43

[Article by Guenther Ludwik: "Mirror Reflection of Decadence"]

[Text] Communities and associations quarrel with electric power providers about the cost of solar and wind energy. Public promotion of alternate energy misses the mark. Other countries are farther ahead.

What the Aachen city parliament decided in a rare unanimity across party lines the Nordrhein-Westphalen commerce minister, Guenther Einert, undid with a stroke of the pen. He refused to authorize rate hikes for electric power fed into the public utility network from privately owned wind turbines and solar power plants.

The Aachener owners wanted to be paid 30 Pf/kWh for wind energy and even 200 Pf/kWh for solar energy. [Pf = 0.01 DM]

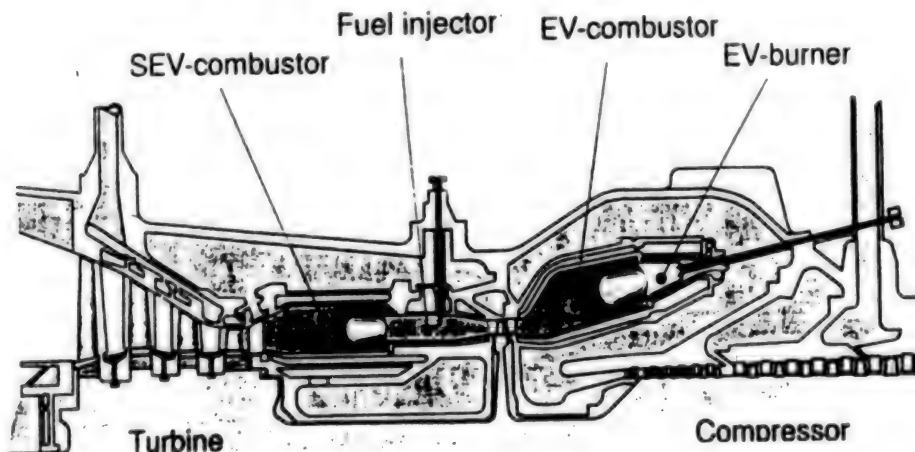
Thirty-five cities and townships are now demanding larger compensation for regenerative use of energy. Expectations which such sort of environment-friendly proposals raise are in reality dashed all over the country. The energy provider Mueritz-Oderhaff (EMO) AG in Neubrandenburg blocked three ready-to-operate wind power plants for several months, reports Dr Gotthard Schulte-Tigges of Eurosolar's regional Berlin-Brandenburg group. Discussions about hook-up to the public utility network continued for eight months.

The electric power provider hit on an idea. In one location the Uckerwind Management Company has already let 700 m of underground cable be laid for a price of 70 DM/m. The last 100 m, however, the EMO wanted to lay itself for any price, provided it were to receive an advance payment of exactly DM185,000. The local press scared the citizenry that, owing to availability of wind power, they will have to pay 7 Pf/kWh more.

The Uckerwind business manager, Joerg Kuntsch, believes he knows the reason for this controversy: the EMO must pay only 10 Pf/kWh for coal energy coming from Lausitz, while Uckerwind asks for 16.6 Pf/kWh for energy fed into the utility network.

The Schoenau township with a population of 2500 in the Southern Black Forest will no longer put up with these stalling maneuvers. A citizens' initiative opposing the township council is to push through a resolution that the franchise contract with the KWR energy provider not be prematurely extended. This year the citizens have a chance to take over management of the public network and, as a model for the entire Federal Republic, supervise the ecologically sound conversion of the local electric power supply system. For this they will need about

GT24/26 Sequential Combustion System



Staged combustion chamber: high performance, low fuel consumption, low emission levels

DM3.8 million, and the GLS bank is willing to raise the money from a nationwide partnership fund.

In regional squabbles about alternate energy it is the power giants who enjoy the strongest backing. On the federal level, meanwhile, the commerce minister, Guenter Rexrodt, has the legal authority over the Land (State) ministers of commerce. In a memorandum to all he has made it clear that he will not approve cost-covering rate hikes applied for by local communal electric energy providers.

Practical implementation of this model of energy supply from alternate sources will obviously require billing the consumer about 1 percent more for electricity. Against this the Association of German Electric Power Plants in Frankfurt am Main argues that such a compensatory rate hike is just "a further subsidy at the expense of business and residential electricity consumers." This sort of accounting gets no corroboration by Prof Helmut Tributsch, director of the Solar Power Engineering Department at the Hahn-Meiner Institute in Berlin. "Solar energy seems to be too expensive only because we burn fossil fuels without paying for the accumulating debt to the environment. Consequently, energy taxes should offset the apparent economic disadvantage of solar energy. The widespread short-sightedness and arrogance vis-a-vis solar energy is in my opinion a clear mirror reflection of the decadence of our technoeconomic civilization."

At the same time, for instance, Germany is not behind Japan and the U.S. when it comes to public financial support of solar energy development. However, while in Germany many expenditures and projects aim to mollify the open-minded and therefore confused public (the motto being: "something is being done, but unfortunately the technology is too costly"), other industrial countries are methodically planning for commercialization and cost reduction. Says Tributsch: "For corrective measures Germany would have to re-examine both the flow of research moneys and current subsidies to industry."

So as to hasten the utilization of solar energy, Eng Manfred Kern from Chemnitz proposes the following four-point program:

- enactment of laws ensuring preferential utilization of renewable energy sources;
- approval of state grants assisting enterprises engaged in further development of necessary systems, plants, and cells;
- active involvement of municipal offices in ensuring that the possibility of utilizing alternate energy be pursued in rehabilitation and renovation of single- and multiple-dwelling houses, residential and sport facilities;
- inclusion of a unitized solar heating plant in bids put in on the building market.

Right now the chances that these ideas will be implemented are just not very good. Industry is not investing, because it sees no market. And a market is not generated, because industry cannot deliver at acceptable prices. This vicious circle could cost Germany dearly, according to Joerg Schindler and Dr Werner Zittel of the Ludwig Boelkow System Engineering in Ottobrunn: "German industry will find itself in a tight spot, because Japan has been pursuing this matter quite aggressively."

BIOTECHNOLOGY

France: Medicine for Cystic Fibrosis Through Plant Transformation

94P60264B Paris LE MONDE in French 1 Jun 94 p17

[Unattributed article: "Cystic Fibrosis: Medicine Made by Plants"; "A Hope Born from the Alliance Between a Pharmaceuticals Plant and a Seed-Producing Facility"]

[Text] Aided by molecular biology's latest tools, the Jouveinal firm's researchers have succeeded in purifying human as well as other mammal genes specific to many gastric lipases (enzymes produced by the stomach and necessary for digesting fats).

One of these, isolated from a dog's stomach, is particularly effective for activating pancreatic secretions—which, when absent or insufficient, causes many human maladies, among them cystic fibrosis, a very frequent and severe hereditary affliction affecting in Europe one child in 2,500.

In order to produce this lipase industrially, in other words to "graft" this animal gene into the chromosomes of an organism capable to synthesize cheaply large amounts of the corresponding protein, the researchers could choose among a number of solutions. Among them, there is one using microorganisms and farmed "transgenic" animals (in whose genotype the alien gene is to be introduced), a solution applied by many industrial research laboratories for producing pharmaceutical substances (LE MONDE 18 September 1991).

For technical and financial reasons equally, Jouveinal has finally opted for the vegetal. According to the company's director, Pierre Le Sourd, "When compared to animal biotechnologies, the production of therapeutic enzymes through plants offers better safety guaranties against viral contamination, while providing a very cost-effective, large scale production." Advantages even more valuable can be derived from transforming genetically tobacco or, even better, rapeseed plants into true "molecule factories," by a method developed recently at Limagrain, the world's third largest seed production facility, in a fashion common to many other international associations.

By deciding to join their know-how, the two enterprises have concluded a four-year agreement and set aside about 20 million French francs for the project. They

hope to obtain a productivity of one kg purified lipase per hectare of rapeseed. Limagrain will be responsible for the plants' genetic manipulation, the cultivation of the fields, and for the first stages of extracting the lipase. Jouveinal will be charged with enzyme purification, studying its biological activity, and with monitoring the medicine's—hoped for—safety and performance against the digestive attacks (symptoms) of cystic fibrosis.

Relatively easy to manipulate genetically, the rapeseed is a storage organism with a natural metabolism totally geared for protein production. Its use, therefore, appears particularly well adapted for producing molecules of industrial or therapeutic interests.

Well versed in vegetal transformation technology, Limagrain has also concluded a cooperation agreement with the Regional Blood Transformation Center (CRTS), on 9 May in Lille, with the objective of producing, via plants, certain human proteins existing in the blood (albumin, alpha-1-antitrypsine, hemostatic factor).

Germany: Interferon Gamma from Bacteria Mimics Natural Model

94WS0310B Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German, 8 Apr 94 p 8

[Unattributed article: "Bacteria Produce Interferon Gamma"; "Fraunhofer: The Yield Reaches One Gram Per Liter of Bacteria Culture"]

[Text] Frankfurt. At the Fraunhofer Institute of Toxicology and Aerosol Research in Hannover there has been developed an interferon gamma which is said to be even more effective than its natural prototype. In the human body interferons are by T cells and activated wherever cells become diseased or are threatened by a virus. The interferons attach themselves to receptors at the appropriate locations on the top side of a cell and from there send their signals to its nucleus. This, reports the Fraunhofer Society in Munich, causes the cell to boost its defenses.

In their work the researchers, Dr Bernd Otto and his associates used what may be called a trick: the DNS chain containing the information necessary for protein buildup was shortened at the critical place so that the proteins lost a few amino acids. Upon being inoculated with a molecule of this modified genetic substance, bacteria produce highly effective interferon gamma.

It is further claimed that the bacteria strains produce each one gram of interferon per liter of bacteria culture. Because the bacteria do not excrete the interferon during metabolism, they must be kept in a pressure container. The thus retained protein clusters must be decomposed, renatured, and purified.

The process of manufacturing the new active interferon gamma has, according to the reports, already passed the laboratory stage and been further developed. It is now to

be marketed by the Rentschler GmbH [GmbH = Ltd] in Laupheim. The new interferon gamma is expected to be ready within a few years for clinical tests.

The tests will show whether and how this market will develop, hopes Friedrich E. Rentschler. It is expected that this interferon will be just as helpful in rheumatic and contagious diseases as against allergies and chronic diseases of the immune system.

The interferon thus produced by genetic engineering and the process by which it is extracted have already been patented in Germany, patents covering both European and American markets having been applied for, reports Dr Bernd Otto at the Fraunhofer Institute of Toxicology and Aerosol Research ITA (1 Nikolai-Fuchs Str., 30625 Hannover; Tel 0511-5350-273, Fax 0511-5350-155).

Germany: DM100 Million Appropriated for Gene Therapy Research

94WS0310D Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 13 Apr 94 p 8

[Unattributed article: "Bonn: 100 Million DM for Gene Research"]

[Text] Bonn. Within the coming five years the Federal Ministry of Research will provide about DM100 million for speeding up utilization of the results of gene research. Paul Krueger, Federal Minister of Research, announces that the emphasis in the new research program, "Methods of Decoding and Utilizing Biological Building Charts," is on development of therapies against diseases.

This program is designed, above all, to stimulate the use of exceptionally- high-capacity computers and automated techniques in analytical procedures for decoding genes as carriers which carry heredity information and thus the important life's important building blocks. Genome research should help make it increasingly possible to put medicine, the pharmaceutical industry, and agriculture on a new scientific basis. An example of successful genetically engineered production of drugs is the "Factor 8" against hemophilia, which until now had to be isolated from human blood.

According to expert estimates, over 4000 diseases at least can be traced to defects in biological building charts. Ernst-Ludwig Winnaker, director of the Genetics Center in Munich, reports that German researchers had played a substantial role in identifying the genetic causes of various diseases such as muscular ones and chorea, also heart and blood circulation diseases, and intestinal cancer.

Krueger points out that the U.S., Japanese, British, and French industries are already heavily engaged in this prospective field. This, in the opinion of specialists, requires that the licensing procedure be shortened. Looking at the soon to be amended Genetic Engineering Law, Axel Kleemann of the Pharmaceutical Works in

Dresden has pointed out that it is not sufficient to correct the law but also the new rules must be better implemented.

COMPUTERS

France: Bull To Sell Mainframes With New Cisc Processors

BR0706150894 Paris *ELECTRONIQUE INTERNATIONAL* HEBDO in French 5 May 94 p 40

[Article signed Y.A.: "Parallel Technologies Support Expansion of Mainframe Servers"]

[Text] Thanks to its new Cisc [Complex Construction Set Computer] processors combined with a parallel multi-server architecture, Bull is slowly opening up its company mainframes.

"Parallel" technologies are in the process of redefining the concepts of large and medium-sized mainframe systems. IBM recently announced a renewal of its supply in mainframes built on its Cisc 390 processors thanks to solutions called "parallel transaction or interrogation servers." Mainframes are in the process of becoming secure information servers. It is now Bull's turn to unveil a new range of large and medium-sized company mainframes which mark a technological break with its previous range (DPS 7000/700 and 700/400), thanks notably to the achievement of Symmetrical Multiprocessing Technologies (SMP) but also thanks to the use of a "home" Cisc processor with a very high integration density. (The processor developed in Cmos [Complementary Metal Oxide Semiconductor]/VLSI [Very Large Scale Integration] technology by Bull integrates 4.7 million transistors. It runs at 66 MHz and offers 30 Mips [million instructions per second] power)

Up to 24 Parallel Processors

These servers can integrate up to 24 processors in parallel (6 cards with 4 processors) and are defined according to a number of models in relation to the missions they are destined to carry out: mainframe on a transactional processing environment (up to 7,000 active users), network server (up to 1,000 users), relational applications server, and client/server in a production environment and as a decision-making aid. On each of the cards interlinked by a bus with a debit of 500 Mo/s [Megabyte per second], processors communicate with each other with the help of an interconnection network with an output of 1 Go/s [Gigabyte per second] and sharing a memory faceplate of 64 Ko [Kilobytes] (Footnote 2) (The faceplate coherence is directly managed by the GCOS7 mainframe operation system in which a EXMS multiprocessor extension was jointly developed). The result is an increase in power of over 50 percent compared to the previous range and an improvement in the performance/price ratio which, according to Bull, is of a factor of three. These new capacities mean important gains in terms of transfer rates (local network at 100

Mbits/s instead of 10 Mbits/s) in particular under TCP/IP [Transmission Control Protocol/Internet Protocol] for client/server applications while discharging (thanks to the parallelism) the main servers from their communication tasks. The cost of the Mips on the network server is to the order of 20,000 French francs [Fr] while it used to be about Fr180,000 on the previous range and Fr60,000 on the most recent generations of parallel servers. The expansion to open systems (Unix) and to client/server applications, which requires a lot of communications to render the heterogeneous nature of the systems transparent to the user, are not only becoming possible but also accessible in terms of cost.

Siemens-Toshiba-IBM Cooperation to Develop 64-MB Storage Chip

94WS0372A Frankfurt/Main *FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT* in German 26 May 94 p 8

[Text] Munich (Reuter). Three leading electronics companies—Siemens AG of Germany, Toshiba of Japan, and IBM of the United States—are notably expanding their cooperation in the development of computer storage chips. Siemens of Munich reports that the three companies want to begin immediately to develop the second generation 64-MB chips jointly. The three companies have been working together since 1992 on the current developmental step—the 256-MB chip. The same companies have been cooperating in other electronics fields for a long time.

The dynamic 64-MB read/write memory is to be developed in the IBM laboratories in East Fishkill, New York, and in Essex Junction, Vermont. The participating companies will share in the costs. A Siemens spokesman indicates that the costs will probably come to several hundred million German marks [DM]. The experience gained in the ongoing cooperative work on the 256-Mb chip will enrich the new cooperative venture.

Siemens reports further that a first working model of the new 64-MB chip is to be ready as early as 1996. The chip can be expected to appear on the market in 1997. Its storage capacity will be able to hold the text content of more than 2,000 typed pages. Currently, the computer market is still dominated by the two-generations older 4-MB chip.

Siemens and Toshiba have been working together since their joint development of the 1-MB chip, standard cells, and the so-called "gate arrays." IBM is involved in a joint venture with Toshiba in Japan on the production of flat color screens. The same two companies are also cooperating in flash-storage technology. To date, cooperation between the three companies has been limited to the development of the 256-MB chip.

IBM and Siemens are also jointly developing the first generation 64-MB chip, the first working model of which was shown last autumn. The only cooperative production venture between IBM and Siemens is in the case of

the 16-MB chip. According to Siemens, further cooperation in semiconductor production has only been discussed in general terms, with no specific projects named.

DEFENSE R&D

Germany's Rexrodt: Changes Needed in Technology Policy

94P60279A Frankfurt/Main FRANKFURTER ALLGEMEINE in German 9 Jun 94 p 15

[Text] Bonn, 8 June. Research support should be extended to the use of new ideas in pilot products. This was the view of Guenter Rexrodt, Federal Minister for Economics, and Hans Wohlfart, the president of the Working Association of Industrial Research Associations (AiF). Technology policy of the traditional pattern has often been inadequate, said Rexrodt. A comprehensive innovation policy must include the entire sequence of the innovation process from the discovery of the idea up to market readiness, he said. Speaking at the annual AiF meeting in Cologne, the FDP politician Rexrodt advocated a basically new approach in this direction in order to facilitate the conversion of research results into new products.

Wohlfart too said that the efforts of the state and industry must lead to usable innovations. He urged that pre-competitive organized industrial cooperative research should be supplemented by supporting applications research, related to products and processes, in small and medium companies. This support could start from the results of cooperative research and extend as far as pilot applications. Moreover, Wohlfart appealed to politicians to raise the support for cooperative research from the current 170 million German marks [DM] to the actual need of about DM250 million, and to eliminate the freeze on expenditures for 1994. Rexrodt said that the budget freeze would not burden cooperative research.

In view of the forty-year existence of the AiF, Rexrodt, Wohlfart, and Tyll Necker, the president of the Federal Association of German Industry (BDI), stressed how this instrument of industrial cooperative research has proven itself. In 1950, Ludwig Erhard, then the Minister for Economics, provided DM1 million in his budget for the first time for "strengthening the capability of small and medium industry." In 1954, 20 research association of various industrial branches joined to form the autonomous organization AiF. During the past four decades, more than 10,000 projects have been financed with more than two billion marks of public funds and at least twice as many from industry's own funds, Wohlfart said. The basic elements of cooperative research—cooperation of companies in research associations and availability of the results without charge—have proven themselves in the new laender as well, according to Wohlfart. In the new laender, 3000 medium and small enterprises and 34 research institutes have become members of AiF associations. Four new research associations from eastern

Germany have broadened the spectrum of industrial branches. As a project manager, the AiF administers one-third of the federal government's subsidies for the new laender. The federal research aid for the new laender was well received by small firms in particular, according to AiF. Stabilization at a low level was unmistakable, said Wohlfart, who himself is the business manager of a textile company in Saxony. However, eastern German small business had too little capital to be able to do research themselves. For this reason, continuity of state research aid was all the more necessary, he said.

Rexrodt feels that a critical examination of AiF processes and instruments is necessary. He asked whether the right research projects are being supported and whether the distribution of means is still flexible enough to keep up with the rapid pace of worldwide innovation. Wohlfart also felt that it was important to simplify and streamline AiF administrative procedures. Important progress has already been made in this area, he said.

ENERGY, ENVIRONMENT

Germany: Waste Tar Converted Into Fuel

M12505100694 Wuerzburg UMWELTMAGAZIN in German Mar 94 p 120

[Text] There are numerous tar dumps in the new federal laender, the result of lignite coking residue dumping. A two-stage conditioning process developed by Wuppertal-based OeKa can be used to obtain a solid fuel from this matter, which is rich in phenol and aromatic hydrocarbons.

If a lime-based storage mineral (Novomix) in suspension form is stirred into the tar, it both reduces the odor given off and creates an initial liquid fuel that can easily be piped off. In the second stage, Novomix-F is added continuously as a compacting agent, within a short time turning the tar into a solid substance matching raw lignite in appearance and calorific value. This material can consequently be burned along with lignite. The storage minerals' basic components bind the acid components of the flue gas during combustion.

The process has been successfully tested in a pilot project supported by the Land of Brandenburg. The storage mineral, which OeKa Environmental Engineering developed together with various universities, can be used to immobilize pollutants found in gases, fluids, and solids.

UK: British Industry Works Toward Voluntary Environmental Protection

94WS0364C Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 19 May 94 p 8

[Article by Arno Noeldechen: "Experts Say Demands of Rio Environmental Conference Technically Workable"]

[Text] Frankfurt. Scientists, politicians and representatives from British industry discussed at a technical meeting this spring in London the options already available today for effectively countering the continuing increase of carbon dioxide in the earth's atmosphere. The experts agreed that one country alone cannot solve this problem [which affects] the entire earth.

Almost unnoticed by the German public, England is actively involved in environmental protection. The country orients itself very closely around the guidelines of the Rio de Janeiro Agenda 21. Government and industry have recognized that there is also money to be made in environmental protection, whether with ecologically compatible, economically manufactured products or with the application of the science of management to gain control over environmental problems [facing] Britain and Europe.

In England, federal institutions and authorities perform more of a monitoring and advisory function, while industry itself—without comparably strict laws or regulations as in Germany—takes action on its own initiative.

As Sir John Mason from the Manchester Institute of Science and Technology explained at the meeting, the signs are increasing that the feared severe climatic changes brought about by the constant increase in atmospheric carbon dioxide will not lead to such rapid changes in average temperatures as had so far been predicted by computer simulations. Mason, who has been involved with the questions of global climate for nearly 20 years, is one of Britain's top meteorologists.

Mason bases his statements on improved computer simulations. The great depths of the earth's oceans had until now not been taken into consideration in the calculations, because we had no knowledge of how great the bonding power of carbon dioxide at various water depths really is.

It has meanwhile become known that there are powerful deep currents between the Atlantic and the Pacific Oceans which could bring about a comparatively fast distribution of the carbon dioxide picked up from the atmosphere. Rough calculations suggest that contrary to earlier assumptions the oceans can absorb almost twice as much industrially released carbon dioxide.

In the end, this observation is in fact not comforting, but it does push the time period for global warming far into the next century. Thus, more time remains for the industrialized nations to substantially reduce carbon dioxide emissions.

Great Britain sees Germany's packaging regulations in particular as a warning example. They have led to increased waste export and not to actual waste reduction. In the United Kingdom, they are pursuing another way to encourage and support industry in developing and offering environmentally friendlier products and services.

Funds are being made available for this purpose in the 1994 British budget. Clive Brewer, the British government's Director for Environmental Protection, refers to the growing world market for environmental protection technologies which for 1992 is estimated at about \$210 billion. In 1992, Great Britain exported about \$800 million worth of products in this market alone. Brewer expects that this share will show high growth rates in the coming years. In the meantime, British industry has already started to switch over to products and production processes to minimize carbon dioxide emissions and other environmental pollution within Great Britain, [something] which is also occurring in the other countries in the European Community. London emphasized, however, that this is happening first and foremost on a voluntary basis and that the government itself hardly needs to reach for specific laws or regulations.

Dr. Arun Watts, Technical Director of the ICI [Imperial Chemical Industries] Plastics Division, offers as an example the production of plastic foam from polyurethanes using newer methods of production. A non-volatile isocyanate is used as well as new catalysts which undergo polymerization at low temperatures.

Analyses of the environmental influences in production, manufacturing and reprocessing were done before coming up with an ecologically defensible product. This led to a reduction in all environmental pollution of about 30 percent. It is hoped that a reduction of around 50 percent can be reached by 1995. It was taken into consideration that plastic foam can be reprocessed by means of a chemical conversion.

A high quality polyalcohol is recovered which can be used for the production of a plastic foam with hard plasticity. This plastic foam can then be used for thermal insulation in buildings or in refrigerators or freezers. Since the energy content of the new polyurethane corresponds approximately to that of coal, ICI thinks it makes more sense to burn the material when it is no longer of use than to dispose of it [as waste in a landfill]. According to studies by Dr. Norman Grant, Director of Earth Observation and Science at British Aerospace, Space Division, the measurement data necessary for active environmental protection can be obtained using modern methods of spectroscopy combined with radar and other millimeter wavelength frequency ranges. British Aerospace could make its extensive experience in this area available and thereby substantially ease the accumulation of precise measurement data.

This is also true for moisture measurements and the determination of various gases, which are necessary before industrial methods of production can be changed over to more ecological methods. This can extend to being able to make an immediate determination of the precise moisture and water content of foods: no determination process with this level of precision and operating in real time has been available until now, as Grant said.

For example, radiometric microwave analyses can be made without touching or destroying [the object of measurement] in the range between 100 to 200 ppm in the frequency range between 140 to 250 gigahertz and up to 30 ppb in the frequencies between 22 and 140 gigahertz. This space flight technology of measurement is tested and, according to Grant, ready to be put into use in industry at a feasible cost.

Additional know-how comes from the English atomic industry: within the framework of privatization and restructuring of the AEA (Atomic Energy Authority), a (semi-private) National Environmental Technology Center in Culham was established and a group of experts particularly experienced in planning work and monitoring technology was gathered.

In addition to clients from industry, the center primarily advises the EU Commission on environmental protection with regard to the RDT (research, technology, development) activities which are a part of the Maasticht Treaty. Part of these managerial functions are thus paid for by Brussels out of the comprehensive 12 billion ECU budget for 1994 to 1998.

Computerized monitoring systems recording [data for] all of England come from military observations which are prepared and offered for environmental work by Hunting Engineering in Reddingswood/Bedford. The firm supposedly has at its disposal an extremely precise set of maps. It was put together after 1984 together with meteorological data and stations for measuring radiation.

It is organized in such a manner that government offices and the public can be kept continually informed about all changes in radioactive readings, Kevan F. Daykin, Director of Information Systems, emphasized. Unfortunately, there is at this time no possibility of connecting the German government's monitoring network.

Waste Management International Services, Ltd., works with the broad range of methods and techniques for environmental protection and with the clean-up of the soil and the waters. The company helps businesses and governmental operations to choose what is most suitable from all that is available in various environmental techniques.

[Waste Management] has a great deal of experience in cleaning up contaminated soil and advised Exxon, among others, in the removal of the destructive oil [spillage] after the Exxon Valdez accident in Alaska. [Waste Management] is one example that practical environmental protection can also be a profitable business of international proportions.

FACTORY AUTOMATION, ROBOTICS

France: Cirtes Launches Rapid Prototyping Software

94WS0369B Paris L'USINE NOUVELLE in French
12 May 94 p 63

[Article by Daniel Chabbert: "Rapid Prototyping: Process Adapted to Conventional Machinery"—first paragraph is L'USINE NOUVELLE introduction]

[Text] At the heart of the process is software that analytically decomposes fabrication of the component before reconstituting the finished prototype...

A rapid prototyping process that does not require specialized machinery for component fabrication: This is the solution offered by a research team from Cirtes—the Essin Center for Engineering, Research, and Transfers at Saint-Die, Vosges. Dubbed "Stratoconception," it is adapted to work with conventional equipment such as milling and boring machines and digitally-controlled cutting machines. What's new is that the Stratoconcept software can also work with any CAD/CAM [computer-assisted design and manufacture] software on the market. "For the moment, we're focusing our efforts primarily on the Catia CAD/CAM, in partnership with IBM," says Claude Barlier, director of the center and holder of the patent.

Stratoconcept inputs the specifications for the computer-designed part, decomposes it into a number of basic surfaces (of constant or variable thickness) called "strata," and identifies the reinforcements and inserts necessary for the final piece to do its job correctly. These items are then identified and fabricated directly, using two- and three-dimensional processes performed on plating materials (steel, plastic, wood, etc.). Like a three-dimensional puzzle, the various constituent elements are then lined up and assembled (bonded, welded, screwed, etc.) into a real part that embodies all requisite design specifications. The assembly technique, calculated by decomposing the part, takes into account the mechanical stresses it must tolerate during utilization. "In the future, we will not need glue or mounting attachments," Barlier explains. "We're working now on the parameters for strata that can be fitted together automatically."

Commercialization

Cirtes has already put its technology to work for Eclatec, producing an operational PVC prototype of a lighting mechanism housing—a part that is 400 mm in diameter and embodies complex internal and external shapes. "The prototype took only a week to produce, whereas in the past they took 3 weeks," says Barlier.

But Cirtes can do more than provide customized services for its clients. It is also marketing the Stratoconcept software itself, alone or as part of a turnkey solution. The rapid prototyping platform includes a CAD/CAM work

station and a 1,000 x 1,250 mm cutting machine for micromilling, priced under 800,000 French francs.

Germany: Automation, Robotics Seen as Keys in Industrial Development

94WS0310A Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 7 Apr 94 pp 1,8

[Unattributed article: "New Control Systems Yield Measurable Benefits"; "Preview of Hannover Fair: Emphasis on Automation"]

[Text]

Hannover. This year's Cebit has already received encouraging good notices from exhibitors and connected business associations. They make us hope that the economy has definitely bottomed out. Also this year's Hannover Fair (20-27 April) is expected to receive a positive evaluation. In the foreground of this huge industrial fair, its 6600 or so exhibitors detect a distinct change in the economic trend and, beyond that, indicators of future global technological development.

Market economy and technological development are never at a standstill. Thus the '94 Hannover Fair continues the tradition of displaying the latest industrial developments. One of the major items it offers its viewers is automation technology. High-tech solutions to problems are not only to realize perhaps immediately potential benefits measurable in terms of business economics but also to improve decisively such competitiveness influencing factors as productivity, flexibility, and quality. At the center of it are control systems, including industrial bus systems represented, among others, by the Interbus S-Club and fabrication routing systems. Great significance is attached to various aspects of quality assurance as well as to industrial image processing and automation software, because industrial control systems form the basis of automation in many areas of application.

Last year in Germany industrial control systems such as Numeric Control (NC), Robotic Control (RC), and Symbolic Programming Systems (SPS) had to suffer a DM2.3-billion-large drop in sales. Most of the SPS scraped hardly through with an only -5 percent sales figure, while NC and RC reported double-digit losses.

This decline corresponds to the situation affecting the customers in those areas where SP systems serve the entire capital goods sector, which covers machine manufacturing, the chemical industry, and the automobile industry, and in areas where the other control systems are used, such as the machine tool industry especially.

The increased supply of bus-compatible standard products furthers unrestricted communication. The increasing demand for software lets enterprises in the automation software business report the highest growth

rates, so much so that even the latest developments, such as fuzzy logic and neural networks, are rapidly advancing into the limelight position.

Assembly and handling are, in terms of cost, often the crucial functions in the fabrication process. It may seem, at first sight, that the chief component in modern handling and assembly systems is the robot. Actually, however, for operation it does not rely on its "intelligence" and controls alone but also on peripheral equipment and communication with it.

The most important support a robot receives is from sensors, which today range from simple mechanical tactile feelers through proximity switches and photocells to sophisticated image processors. A high-resolution image recognition device, operating in three dimensions, compares contours precisely down to fractions of a millimeter, with a master pattern programmed by electronic discrete variable feed-in and then recognizes the finest gray grades, as well as color hues.

Assembly, handling, industrial robots, and automation must more than ever be viewed as forming one meaningful entity. A special exhibit under the title service robots serves to illustrate the opening of entirely new applications for intelligent robot systems. At the 25th International Symposium on Industrial Robots on 25-27 April internationally known scientists and engineers are dealing with the manifold application possibilities for robots.

Service Robot Will Be One of the Most Important Components in Production Technology

Hannover Fair hopes for better times; knowledge-based systems will be increasingly used for optimization of upper-level operations management

Among others there are also to be shown service robots such as, for instance: robots which clean, robots which maintain the drive box in electric locomotives, asparagus-harvesting robots, aviation robots, and robots which inspect vertical above-ground structures of buildings.

New applications for service robots are opening up also in medicine and rehabilitation, in care for the aged and handicapped, in bureaus and logistics, in municipal activities, in households, in hobbies and recreation. The "Helpmate" developed by Engelberger Engineering Enterprises TCR is transporting meals and medications in American clinics, not a novelty any more. Robots for steering medical instruments, especially in surgery, have been tested for several years already.

For care of the aged and handicapped the Fraunhofer Institute of Production Technology and Automation (IPA) in Stuttgart, under the direction of Prof Dr.-Eng. Rolf Dieter Scraft, has, in collaboration with European Industry and Research partners, developed an integrated system for steering handicapped-assistance devices.

Use of robots in the building trades is being pushed especially by Japanese manufacturers. The next decade

will see a robot becoming one of the most important component of production technology. German suppliers are well advised to quickly seize the opportunity which this development offers.

The highlighting material flow technology and logistics (CeMAT) exhibit suggests innovations in all sectors of the economy, inasmuch as it includes not only material flow control systems and logistic service capabilities but also delivery and storage techniques along with plant operation facilities. While use of unitized systems for all material flow operations is the key to product line and plant layout flexibility, this concept also leads the way to more cost-effective fabrication.

The surface treatment technology covers an enormously wide range of processes, such as galvanizing, varnishing, enameling, coating, and in each case includes both preliminary and finish treatments. The coating technology, especially in vacuum metallurgy and thin-film production, applies to a wide range of coatings, from functional ones through decorative and protective ones to wear-resistant ones, which also decrease friction between rubbing bodies.

Vacuum metallurgy involves smelting, degassing, and remelting plants and processes in the alloy and thus principally material-making technology. Thin-film techniques, used mainly in both electronics and optical industries, continue to advance and are now applied to data storage media, mechanical and surgical precision instruments, also cutting tools for metal removal, as well as other devices for corrosion and wear protection.

Coating metal-cutting tools with titanaluminum nitride eliminated the need for coolant-lubricant fluids. Great emphasis on thin-film technology is put by the Plasma Technology Initiative NRW, also called Pla Tin for short, and the registered Thin Films sponsoring company in Dresden, along with its member enterprises on company-owned sites in Halle 6.

The electrical engineering exhibit in Hannover is always active on a high technical level, combining classical products and applications with modern system techniques. Thorough automation of power plants and intelligent energy distribution are self-evident.

The most recent developments shown in Hannover indicate that the emphasis is more and more shifting on use of knowledge-based systems in higher levels of management engineering, i.e., they will be used not only as process control support but also increasingly for optimization of upper-level operations management.

Flexible adaptations are also taking place in the building industry, where they lead to profiles in installation layout and illumination design. Modern market-oriented systems for building automation have already been standardized and are available at various stages of construction; ideas and stimuli coming from various sources are

gathered under a common roof in construction management engineering. A decisive role is, moreover, played here by cost savings in heat, air-conditioning, and ventilation.

For illumination, design interest focuses on energy-saving, innovative, and durable products. A long life is, for instance, ensured by the QL-induction lighting system. For decorative illumination, increasing use, besides halogen incandescent lamps, is made of much-improved-color high-pressure sodium vapor lamps.

Now, just as before, the most popular light source is the fluorescent lamp, electronic circuits having been developed for its operation on direct or alternating current, with significant reduction of the otherwise relatively high power losses.

In the field of plant construction and modern materials, Hannover hosts not only the globally active industrial firms in their own pavilions but also many small and medium-sized enterprises in the consulting and engineering services business.

The open-grounds-type exhibition strongly emphasizes energy saving, material recycling, environmental engineering, sewage disposal, and pollution abatement. One inquires here about know-how in implementing project plans up to the ready-for-delivery stage. The exhibition program is supplemented with industrial facilities, special-purpose vehicles, rail transport vehicles, caterpillars for open-pit mining, roller macrobearings, cranes, hoists, and farming equipment.

After being absent in Hannover for two successive years, the air compressor industry makes its appearance again with broad diversity of applications. Compressors in various different configurations are shown, as are various compressor plant concepts for compressed-air conditioning and distribution, with special attention to the attendant electronics.

The exhibit includes compressed-air tools for oilless or air with oil operation, drilling and milling machines, high-speed tools, semiautomatic and fully automatic lathes. Welding smoke exhaust facilities, worker protection and safety equipment, manual and electrically operated tools complete the exhibit.

Ever more attention is paid to certification in accordance with the DIN ISO [German industrial standards; International Standardization Organization] in delivery of components and supplies, where the trend is toward the system approach. Independent institutions such as the German Association for Quality Assurance (DQS) and the Dekra or facility of Associations for Technical Inspection (TUV) Cert examine and evaluate the organization and the procedures in an enterprise. Only after a rigorous quality test procedure do they issue certificates complying with the DIN ISO 9000.

A permanent part of the Hannover Fair has for many years been the "market before the market," meaning the

research and technology market. Also the European Patent Office (EPA) participates in the Hannover Fair, to a larger extent than has been reported on previous occasions, the aim being to make dormant resources disclosed in patents available to qualified members of the public.

Reports issued by the European Patent Office indicate that about DM30 billion are lost annually and that still a considerable part of research funds is being poured into development of already patented products. At a time when hundreds of thousands of jobs are sought in Europe, the Patent Office has assumed the task of making knowledge marketable, of stimulating ideas, of seizing on development trends, and of bringing innovators together with financiers. In collaboration with large-scale research institutes, universities, colleges, and industrial research departments, the Patent Office paves the way for transfer of knowledge into the technical domain.

The convention program offers a diverse abundance of domestic and international seminars and conferences, technoeconomical forums, technical high lights, finance of political and market strategies. By way of "short cuts" the Hannover Fair compresses into eight days: the search for new developments, the scanning of global engineering trends, and detailed inquiries about the various specialty areas. A technology data bank and a reliable research forum are the support needed for innovative communication.

Germany: High-Efficiency Micropump Developed for Gas-Liquid Transport

94WS0364B Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 19 May 94 p 9

[Text] Frankfurt. The Karlsruhe Nuclear Research Center has developed a micropump whose central element is a thin diaphragm made of polyimide. The approximately one-micrometer-thick film is stable up to 400°C. In the various chambers of the pump housing made by means of injection molding from the chemically unreactive material polysulfone, the plastic film is the diaphragm for the pump as well as the diaphragm for the passive inlet and outlet valves. A 0.25-micrometer copper heating spiral positioned on the diaphragm by means of thin film technology and photolithography heats up a gas or liquid in the pump chamber. The medium which is to be delivered [by the pump] is transported along by means of the heat expansion, according to the Karlsruhe Nuclear Research Center GmbH (Coordination and Technology Transfer, P.O. Box 3640, 76021 Karlsruhe: Telephone 07 247-82 55 80). The pump allegedly produces a pressure of 130 mbar. It can transport up to 0.2 milliliter per minute at a pump frequency of 30 hertz. The 7 x 10 millimeter pump can be operated by battery.

Italy: Fiat's Latest Production Plant Described

BR0906152694 Milan ITALIA OGGI in Italian 21 May 94 p 8

[Article by Giampiero Di Santo: "Fiat's New Challenge Comes From Melfi"]

[Text] If the first Henry Ford, the inventor of the assembly line, and Charlie Chaplin, the director and actor in Modern Times, were to walk through the entrance of the SATA [Advanced Technology Automobile Company] arm-in-arm, they would be amazed.

Yes, because here at Melfi, in a plain that is green in spring and parched by the sun in the summer, nothing is left of the world that was created by the former and described by the latter. Even the blue overalls have been replaced by purple work clothes. Not even the infernal work schedules that spurred on the protagonists of Chaplin's film remain, and neither does the continuous line that forced the workers to make the same movements all the time.

Here, in a factory that tries to do as little damage to the environment as possible (its base is sand colored, the upper part is painted with blue and gray horizontal bands), the latest challenge from the Fiat company, the Punto, is being produced. Three hundred and fifty automobiles are produced each day. The number will rise to 400 in June, and 1,600 when the integrated factory is working at full capacity (about 450,000 vehicles per year) with those employed in the plant and the subcontractors totalling 9,000 workers. Everything is automated, from where the sheet steel enters the two Weingarden lines that prepare it for pressing, to the three Schuler and Komatsu 3,200- and 4,800-tonne presses (that will soon become four), to the welding operations (each Punto has 3,500 welding points), to the painting (performed by a Smart robot produced by Comau of the Fiat group) up to the point where it leaves the factory 20.8 hours later. Everything is synchronized in accordance with just-in-time logic. The suppliers supply the lines day by day and in accordance with production requirements. Their factories are there, inside the fence that encloses an area of 2.7 million square meters. They have at their disposal a 700-thousand square meter area and the so-called highway inside the production lines that is used to transport the materials right up to the point where they are required for production. There are now six suppliers, but installations for another 12 are ready. The area is surrounded by a four-lane circular road, and there is a railway terminal that will be used for dispatching the vehicles once it is finished. For the time being, transporter trucks are being used to shuttle back and forth along the Naples-Bari highway.

Giovanni Agnelli's Fiat is launching its challenge to competition from this corner of the South between Basilicata (Melfi is in the province of Potenza), Campania, and Puglia. Innovation, flexibility and participation

are the words that recur most frequently in the vocabulary of the managers in Corso Marconi [Fiat headquarters]. Here, between the robots and intelligent trolleys that only move when it is necessary, "Fordism," the immutable process that could not be stopped, is truly dead. Everything can change rapidly, and the workers participate in the management with ideas and proposals for improvement. The office block no longer exists. The clerks work side-by-side with the workers. The levels of hierarchy have been reduced from seven to five.

There is a training center nearby that prepares a general worker in four weeks, and a specialist in four months. The suppliers are involved in the design of the product and in the study of possible improvements. In short, there is a change of direction to achieve ambitious objectives: When the factory is working flat out each employee will produce 79 Puntos a year, compared with an average of 48 for the industry worldwide.

San Nicola di Melfi is a laboratory therefore. New theories are being tested, new foundations are being laid for industrial relations, original shifts and work hours are being studied (at present there are two but they will become three), the variable part of the salary is dependent on three different factors (the efficiency of the UTE, the so-called Elementary Technological Unit, the efficiency of the workshop, and the efficiency of the company). However, in every laboratory there is a danger that the field trials will disappoint the expectations. They are keeping their fingers crossed at Fiat. The company has invested 3.316 trillion lire (1.355 trillion lire from the government) in Melfi.

LASERS, SENSORS, OPTICS

UK: New Liquid Crystal Technology Conserves Electric Energy

94WS0372D Frankfurt/Main FRANKFURTER
ZEITUNG/BLICK DURCH DIE WIRTSCHAFT
in German 30 May 94 p 10

[Unattributed article: "Thorn EMI Wants To Have the First Text-Reading System Ready in a Few Months"]

[Text] Frankfurt. In the near future, display panels will be able to be operated with much less energy expenditure than has previously been the case thanks to the introduction of new ferroelectric liquid crystals. These liquid crystals can maintain their state even without a constant current. Characters and graphics displayed once can be erased by a short electrical current surge. Transportable computers like laptops, notebooks, and the like, equipped with such displays, can operate for a considerably longer period on one battery charge.

Ferroelectric liquid crystals are capable of changing their orientation under the influence of a current pulse, in the course of which they adjust the direction of polarization of the incident light. Sandwiched between two extensive

polarization filters with correspondingly crossed polarization directions, the liquid crystals of the display panel turn bright or dark, depending on their orientation.

Viewed electrochemically, the ferroelectric liquid crystals are bistable. Electronics engineers at Thorn EMI in Hayes, Middlesex, Great Britain, also refer to the crystals as "electronic paper" because the text or graphics need only be created electronically and then remain.

So far, Thorn EMI has had a liquid crystal display with a 13-cm picture diagonal. The company hopes to bring the first practical text-reading system to production readiness in about 6 to 10 months. In the past, ferroelectric liquid crystals have been used to create color picture and minutely staged gray values on liquid crystal screens. Now by combining the switching properties of the liquid crystals with color-producing factors, it is possible to achieve the color manifestations by means of very rapid back and forth switching.

The "standing" color pictures with ferroelectric liquid crystals also require a background illumination to make the pixels visible. However, Thorn EMI (Department of Security and Electronics, Hayes, Middlesex UB3 8AT, United Kingdom) reports, the amount of energy expended is much less than conventionally used liquid crystal screens, which require a constant current.

Germany: Four-Dimensional Simulation Augments Human Vision

94WS0310C Frankfurt/Main FRANKFURTER
ZEITUNG/BLICK DURCH DIE WIRTSCHAFT
in German 8 Apr 94 p 8

[Text] A series of computer programs for visualization of scientific data is made available by the Dortmund University. They facilitate geometrical modeling and are to simulate the human visual system with its wide data evaluation channel. The Marching-Cube procedure converts surfaces into three-dimensional data arrays, just as they appear in computer-aided tomography and in numerical simulations. The hierarchical Marching-Cube algorithm relaxes the burden of the original algorithm, namely delivering a very large number of surface elements, and thus speeds up the otherwise lengthy process of graphical data displaying. As the Specialty Department Information Engineering VII (Prof Dr Heinrich Mueller, 44221 Dortmund) further reports, a variant of the algorithm was for this purpose developed in Dortmund. This Marching-Hypercube algorithm, the report says, uses time as the additional fourth dimension. By means of free-form deformations and superposition of raster images it now becomes possible to create a continuous sequence of intermediate images between every two already existing ones. The light simulation process, with an LCD-shutter goggles, should improve the form factors in the radiosity process and be more precise in critical situations.

Germany: Laser Interferometer Developed for Biotech Applications

94W50372C Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 27 May 94 p 8

[Text] Light waveguides are mostly used today to transmit large amounts of information over great distances. The Laboratory for Technical Optics in Iserlohn, Mark Brandenburg, (Professor Doctor Burkhard Neumann, Frauenstuhlgeweg 31, 58644 Iserlohn) now hopes to utilize these techniques in interferometers and pulse oxymeters. To this end, the researchers have developed an economical laser interferometer, whose laser light source and electronic components, which take up a relatively large amount of space, can be placed a considerable distance away from the miniaturized interferometer measuring head. Owing to the sensor's small dimensions, position systems, like the cross-table system, can now be retrofitted with this interferometer without difficulty. This has been made possible through the use of a polarization-holding monomode fiber, in which the light source is directed without disturbance to the measuring head, which is a few centimeters in size. In addition, a pulse oxymeter for the determination of blood oxygen content has been developed in cooperation with the Mark Brandenburg Company for Medical Developments mbH in Luedenscheid. By employing a fiber sensor, this instrument can now also be used with nuclear spin tomographs. The light is detected and evaluated in the patient's illuminated finger. The photograph [see original] shows the measuring head set on a control path.

MICROELECTRONICS

France Telecom, CEA Develop 0.35 Micron CMOS Process

BR140613394 Paris LIBERATION in French 16 May 94 p 11

[Article by Paul Loubiere: "Major Step Forward For European Silicon Chips"]

[Text] France Telecom and the CEA (Atomic Energy Commission) have developed a new engraving technique for electronic silicon chips which should allow Europe catch up in this strategic sector.

The end of the European inferiority complex in semiconductors, an area largely dominated by Japan, the United States, and South East Asia, is in sight. The CEA and France Telecom, who are jointly conducting research on electronic components, have just developed a new engraving technique on logic silicon circuits, an essential technique for the industrial production of chips.

This progress is important because Europe has been very much missing from the technological battle being waged between the United States, Japan, and the rest of Asia. At the end of the eighties, Europe was even becoming totally dependent on foreign supply for its electronic

components. This situation was all the more serious because electronic components are becoming a major element in all industrial sectors from nuclear plants to aircraft, from watches to washing machines, from computers to automobiles. In a nutshell, the share of chips in consumerables is constantly growing.

The European Commission reacted a little late in the day in 1990 when it created JESSI (Joint European Submicron Silicon Initiative), a research program grouping together the main manufacturers in the sector (Philips, SGS-Thomson, Siemens, Matra). A year later, in 1991, the CEA and France Telecom joined forces to form an EIG [Economic Investment Grouping] working within the framework of Jessi. The task of the EIG was straightforward: to provide Europe, within three years or less, with sophisticated silicon engraving technology. Both public bodies managed to meet this demand within the given deadline.

So what are we talking about? In simple terms, silicon chips are subject to two conditions: They must have increasingly large capacities and be increasingly small in size. "Think of a book," Xavier Dariel, an engineer at the CEA, explained. "If you want to increase the number of chapters without increasing the number of pages, then you have to reduce the typeface. This is somewhat similar to what we are doing with components. We are engraving logical circuits on to small squares of silicon. To reduce their size, we have to develop techniques to enable increasingly finer circuits to be engraved."

Currently the chips have micron-sized engravings, in other words the size of a hair divided by 50. France Telecom and the CEA have overcome the micron barrier to reach 0.35 microns, and will soon reach 0.25. "Our innovations have enabled 1.5 million transistor test memories to be manufactured which were perfect right from the first production batches," the EIG director explained.

Teams working in CNET [National Telecommunications Study Center] in Grenoble (France Telecom) and Leti (CEA) managed to succeed in the feasibility demonstration of this new technique, the so-called CMOS (Complementary Metal Oxide Semi-Conductor) in 0.35 micron technology. The validation of results should be carried out immediately at the Crolles (Isere) industrial plant and would enable the development of a 0.35 CMOS micron facility there from 1995 onwards.

The main innovations remain the use of deep ultraviolet photoengraving and mechanical-chemical polishing techniques to completely level the dielectrics (insulation) after depositing. They also involve the structure of the drains and transistor sources, the use of ultra-fine oxide grids or the definition of doping transistor channels. The interconnecting network includes three layers of aluminum alloys. The feasibility of a new deposition method of nitride-titanium distribution barriers has also been demonstrated. Specialists will value this.

"This technological progress opens up the way to future generations of 0.25 micron technology and less," the director said. "They will contribute to Europe continuing in the race towards the miniaturization of electronic components which, we know, will influence the competitiveness of a large number of constantly expanding industrial sectors."

Semiconductors are a strategic technological challenge and should be worth some 600 billion French francs in 1994, according to Dataquest (a bureau specialized in the study of and prospects for technology). The number of applications is constantly growing and the market could be worth a thousand billion French francs by 1998.

The geographical distribution of semiconductor consumption proves revealing. Consumption in the Asia-Pacific region should exceed that of Japan in 1995, Dataquest predicts, with an expenditure of \$28.09 billion in 1995 for the purchase of semiconductors compared to \$22.83 billion in 1994, and \$27.32 billion against \$26.61 billion for Japan.

"We have raised our estimates for the Asia-Pacific region because we anticipate a continuation in the explosive growth experienced in 1993," Gene Norrett, who is responsible for semiconductors at Dataquest, said. The Asia-Pacific region should represent 28 percent of the semiconductors market by 1998, or \$26.72 billion, with China being the main consumer in this region.

Germany: Siemens To Build New Semiconductor Plant

BR0906111194 Paris *ELECTRONIQUE INTERNATIONAL* HEBDO in French 5 May 94 p 13

[Text] Siemens has decided to invest 300 million German marks in the production of semiconductors in its Ratisbonne-based plant (Germany), where the Dram 1's and 4 Mbits and logical circuits in 1 micron technology are being produced. Jurgen Knorr, head of the German group's semiconductor division, had recently announced that the company considered expanding one of its existing sites, on top of the planned investments in Dresden, in the former GDR. Siemens is planning to construct a new production unit in Ratisbonne, which will mainly develop logic circuits, thus creating around 200 jobs. Production at the new unit could start in mid-1995.

European ESPRIT Consortium To Develop Flat Panel Displays

BR0106100594 Luxembourg *INNOVATION AND TECHNOLOGY TRANSFER* in English Apr 94 p 21

[Unattributed article: "Flat Panel Displays: A European Challenge"]

[Text] ESPRIT Project 7701, European Consortium Active Matrix (ECAM), is a large-scale, industry-led

project aiming to capture a share of one of the fastest growing markets in IT peripherals—active matrix LCD displays.

The lead partner in ECAM is the Netherlands electronics company Philips, which combined forces in 1992 with French companies Thomson and SAGEM. The result was "Flat Panel Display Company," a joint venture company based in Eindhoven, the Netherlands, employing over 500 people. They have established two factories—a pilot line, where most of the new developments are tested, and a full-scale production assembly line, the largest in Europe.

"Tomorrow's market in LCDs is enormous, because they will soon move from portable computers to all sorts of consumer and industrial equipment," explains Dr. Robert Hartman of the newly established company. We estimate a market of over ECU1.5 billion by 1996. Unfortunately, the world's five largest LCD companies are all Japanese. They have a strong position on the market, so if we do not invest today we will always rely on foreign sources for what will become an essential element in many new electronic systems."

Started in January 1993, the ECAM project involves a total of 19 partners from the Netherlands, France, Germany, the United Kingdom, and Belgium, and is composed of 11 subprojects. The overall aim is to develop technologies and components to make feasible larger display sizes and/or higher resolutions, increase the number of potential applications of LCD technology and develop less complex designs and more cost-effective production methods.

Simpler and Cheaper Technology

Of the eleven subprojects, the most important is "2S-3S Thin Film Transistors." "Briefly, 2S and 3S refer to the number of steps required to produce the LCD matrix," Dr. Hartman explained. 2S technology can be used to manufacture computer monitors, while the 3S system can be used in TV projectors.

"2S and 3S were patented by SAGEM's [Company for General Applications of Electricity and Mechanics] research partner, CNET-France Telecom, the French telecommunications laboratory," he continued. "The subproject has two elements: SAGEM and CNET are transferring both 2S and 3S as "direct view technologies" to our pilot line here in Eindhoven, and Thomson in Moirans (near Grenoble, France) is developing a "projection" 3S display."

These new technologies are simpler than those used today and use less raw materials, adding up to a less expensive factory, both in start-up and running costs.

A Complete Project

In general, most of the other partners are involved in one or two subprojects specific to their interests. BARCO, a Belgian manufacturer of TV projectors, for example,

aims to develop active matrix LCD projectors that can display video and data graphic images with XGA (1024*768 pixel) resolution.

In this way the joint venture combines specialised expertise from around Europe and ensures that the technologies have a range of marketable applications ready as soon as possible.

There are also four universities and private research laboratories contributing their expertise. The University of Dundee in the United Kingdom, for example, is contributing its knowledge of certain types of amorphous alloys to the SWITCHMAT subproject, where materials for TFD-R (Thin-Film Diode plus Reset) devices based on amorphous silicon alloys are being developed.

TFD-R devices hold out the promise of a low-cost, high-yield production process, but also have some drawbacks. The University's experience with similar alloys will help in the assessment and perhaps the exploitation of this potentially valuable method.

Other subprojects are developing additional applications and materials, examining future technologies, working on international standards and plotting the joint venture's R&D programmes. According to Dr. Hartman, "We are quite pleased with results so far, particularly in the important 2S-3S subproject, and expect to complete the project by the end of this year as planned."

Contact: Dr. Robert Hartman, Flat Panel Display Co. (FPD) B.V. Tel.: 31-40-744-538, Fax: 31-40-742-220.

European Firms Attain Profitability, New Products in Microelectronics

94WS0344A Duesseldorf WIRTSCHAFTSWOCHE
in German 6 May 94 pp 92-98

[Article by Burkhard Boendel: "Never Say Never"]

[Text] Europe's semiconductor manufacturers are once again making gains after years of severe rationalization. In the new growth markets their new products have excellent starting positions.

When the Association of German Electrical Engineers (VDE) had evaluated a survey on the state of German microelectronics sent out to electrical engineering and electronics firms and mechanical engineering firms last year, the result was depressing: two-thirds of the owners and managers surveyed judged that Germany would lose its share in world leadership or had already lost it.

The magazine BILD DER WISSENSCHAFT also asserted in its March issue that Germany's manufacturers were threatening to "sleep through their last chance in microelectronics" in the case of application-specific chips, so-called ASICs. Current statistics seem to corroborate the pessimists: in 1993, for the first time,

no Europeans were represented among the top ten semiconductor manufacturers in the world. And the Americans have taken over the leadership in production in Europe.

But in reality other facts than the bare market figures leave little room for self-pitying laments. Europeans are producing again in Europe and are investing, particularly in new chip factories ("fabs").

—Last year the Finnish electronics company Nokia AB moved its color television production from Singapore back to Bochum. This was made possible by a new chip from Philips. The color decoder—the key to picture and color processing—combines all the necessary functions on a single silicon square. The advanced integration carried out by the Dutch company brings such great savings in cost that the return to the Ruhr area was worthwhile.

—A few months ago, SGS-Thomson opened Europe's most modern production plant in Crolles near Grenoble, where the French-Italian company produces semiconductors with structures of 0.5 micrometers, soon even 0.35 micrometers.

—Siemens is expanding its plant in Regensburg, where 4-megabit storage chips—so-called DRAMs—are produced, and is building a top-quality wafer factory in Dresden for 2.4 billion German marks [DM] to manufacture 16- and 64-megabit chips.

—At the end of May Temic Telefunken Microelectronic GmbH will open a new factory in Heilbronn, among other things for the manufacture of components for infrared data communication. These will mean the end of the cable spaghetti between laptop, printer and modem. It is not only for the modules which integrate sender and receiver on one chip that Temic is assuming the role of a global frontrunner. The production technology which comes with it is also worth showing the world: the silicon wafers are in hermetically sealed transport cubes—so-called Standard Mechanical Interfaces (SMIF-POTS)—which are opened by processing robots at the processing stations. The new processing technology makes it possible to have spatially limited clean rooms with correspondingly lower investment and with throughput time cut in half. "Here we are more than a year ahead of the Japanese and the Americans in technology," proclaims managing director Frank Dieter Maier proudly.

The investments are the expression of regained strength and a signal "that we are going on the offensive again," says Doug Dunn, chairman of the board of Philips Semiconductor International BV in Eindhoven (see accompanying interview). By now the competition has noticed it too: Armin Vogel, marketing manager of Intel GmbH in Munich, notes, "The efforts of the Europeans in recent years have been significant, we're paying more attention to them." And when technology gurus like Daimler-Benz director Hartmut Weule talk about the "strategic significance of microelectronics for Germany's

international standing," the all-clear can be sounded: "We have not been poor relations for a long time now," concludes Ingolf Runge, director of the Fraunhofer Institute for Solid Body Technology in Munich.

The first and most important step for the European renaissance in semiconductor market is the regained profitability of the European quartet of Philips, SGS-Thomson, Siemens and Temic (see accompanying box). But not only the global players are winning. Small chip boutiques like the Society for Silicon Applications mbH (SICAN) in Hannover or the Microelectronic Applications Center GmbH Thuringia (MAZET) in Erfurt are setting up a high-tech network all over the country and are providing services particularly for mid-sized companies with special chips in small numbers.

And research institutions like the Heinrich Hertz Institute for Information Technology in Berlin also contradict the ominous croaking about Germany being behind in microelectronics. For instance, the Berlin information technologists recently succeeded in combining lasers and photodiodes in a component using electronic chips. The system transforms optical signals to electrical ones, and vice versa. In the near future this technology will make possible the cheap production of optoelectronic components, such as will be required in massive quantities for the planned data highways. This masterpiece from Berlin caused worldwide turmoil. The American telecommunications giant AT&T was among the first companies to acquire test samples.

The most impressive example of the Europeans' new strength is the production of so-called DRAM storage at Siemens. Until one and a half years ago the factory in Regensburg resembled a shredder for thousand-mark notes. The company pumped several billion marks into development and production. In spite of their immense efforts, the business was running a deficit for a very long time—until two years ago, when Ulrich Schumacher, then 33 years old, took over the sector, which had been left for dead. With management methods like simultaneous engineering and a systematic orientation of the development team toward process and product optimization, the youngster achieved the turning point. Within a single year yield from the Regensburg factory nearly doubled, from 45 percent to over 80 percent, the silicon surface for the chip was reduced from 75 to 58 square millimeters, and the production process was simplified from 18 steps to 15. Now Siemens is running the most rationalized production site in the world for 4-megabit storage chips. "That is our cash cow," Schumacher says gleefully. The result: While until recently Siemens' retirement from the DRAM business was taken for granted, now Regensburg is being expanded—and in Dresden a completely new plant is being constructed, which board member Juergen Knorr says is intended principally to produce DRAMs.

This makes sense because Siemens has turned itself into a technology leader. Last fall, it was the Munich group of all people, the ones who were always arriving too late

with their new chip generations, who were the first company in the world to present a functional model for a 64-megabit storage chip, far ahead of Toshiba, Fujitsu, Texas Instruments or Hitachi. The race to catch up in technology has been successful.

And there's more. In important growth markets, particularly in ASICs—special chips which are constructed according to the client's instructions—the Europeans are even leading the global technology race:

—An example from telecommunications (market volume: \$10 billion; trend: annual growth of 15 percent). With the GSM standard for digital mobile radio the Europeans have staked their claim in a growth market which will take over the role of the computer industry within the next decade.

Those to profit most from the growth market in chips for mobile radio, besides the American manufacturer Motorola, are mainly Siemens and SGS-Thomson. Technologically the Munich company is a clear leader in the field with highly-integrated chip sets and have a market share of just under 70 percent of components for this high frequency technology: "Besides Motorola there are no manufacturers who do not use our semiconductors," says marketing director Rolf-Juergen Bruess. Nokia—number two behind Motorola in the finished product sector and at present purveyor of the lightest handsets—has now selected Siemens as its strategic partner in chip development and delivery.

—An example from the automotive industry (market volume: \$5 billion; trend: annual growth of just under 20 percent): the permeation of the automobile with electronics will shoot up in the next few years to up to 20 percent of the production value. Air bags, ABS, engine and gear control, air conditioning: nothing will function without silicon. But automotive electronics "is one of Europe's strong points," as Carl Muehlner, business manager of Dataquest GmbH in Munich, acknowledges. Temic, for example, has reduced the price of ABS chips over the last few years by two-thirds. At the same time the efficiency of the component has quadrupled.

And the Europeans are not letting up. For instance, Philips has already set its sights on first place in the electronic road barriers which are now flooding the marketplace. Bosch developed the Controller Area Network (CAN), a data net to which all electrical and electronic devices in the car can be linked. CAN could even make itself into the world standard. Mercedes-Benz is already introducing CAN into top-of-the-line cars.

—An example from the chip card industry (market volume: \$155 million; trend: annual growth of just under 40 percent): Pocket-sized computers scored a breakthrough in the telephone card; now there are further mass applications like health insurance and bank cards (see WIRTSCHAFTSWOCHE 49/1993). Cards as a substitute for tickets in local travel are also being tested. By the end of the decade a world market

of over a billion dollars for the chip card semiconductor alone is beckoning. At the moment Siemens, SGS-Thomson and Motorola are dividing up the business among themselves. The knowhow for future contactless cards is being developed here. Nothing is going to change in the market distribution in the near future. The demands for security and functionality are too elaborate, the price war too bitter.

—An example from the multimedia industry (market volume for all multimedia products: \$20 billion; trend: annual growth rates around 20 percent): Chip producers in Germany have been developing electronics for digital television for years. One of the frontrunners is ITT Intermetall GmbH, subsidiary of the American ITT company, with research, production and management located in Freiburg, which introduced the first components for digital picture and sound processing at the beginning of the 80's and is now moving to the second product generation with the chip set DIGIT3000. Philips, the largest manufacturer of picture tubes and the electronic regulators that come with them, has also developed the components for a completely digital picture and sound processing to the production stage. That these preliminary achievements cannot be converted immediately into world success is due to the fact that the Europeans were unable to agree promptly on the introduction of digital television. Perhaps they will succeed now with digital radio (digital audio-broadcasting, DAB) where they failed with television. At any rate, chips have been developed for digital radio which are already being successfully tested in experimental transmissions by Intermetall. The preliminary studies are not so far advanced either in Japan or in the US.

That leaves the computer. Here the Europeans have not had much to offer until now. In particular, the program completely lacks the proprietary processors with which Intel was able to catapult itself to world leadership with no close rivals. And even attacks against Intel's dominance are not being launched by the European companies, but by Apple, Motorola and IBM with the power PC.

But there is sufficient knowhow in this area in Europe. IBM, for example, had the processor for its new parallel computer developed in the Bonn Institute for Discrete Mathematics under Professor Bernard Korte. Korte says, "We could do the same thing, of course, with a European processor manufacturer." If there were any. But the tendency to hold back is breaking down: SGS-Thomson has started a new business area, in order to enter the market for microprocessors in the near future. Philips manager Dunn, who is ruling out involvement in processors for his company at the moment, knows the golden rule in the chip business: "Never say never."

[Box, pp 96-97]:

"In the Black Again"

The recovery of the European chip industry is progressing well:

—In 1993 Philips was in the black in the chip division. With a gross margin of 11 percent in the semiconductor sector, the Dutch company is among the world's most profitable producers. In 1993, with sales of \$2.3 billion, they dropped to twelfth place in world rankings, but "we want to be at least in eighth place by 1998," says Philips manager Dunn.

—SGS-Thomson is planning to extend its world market share to five percent by the end of the decade, which means doubling the current share (sales: \$2.1 billion) and placing among the top ten. So far the French-Italian conglomerate's plan is working: for years productivity has been rising by 15 percent annually to the current \$115,000 per employee. For high-performance chips which are being used for the regulation of read/write heads in hard disks, and for special storage components (EPROM), SGS-Thomson is unquestionably among the world leaders. In 1993 the company was again able to show a profit: \$160 million. "SGS-Thomson shocks pessimists," was THE WALL STREET JOURNAL's comment on the successful recovery.

—The microelectronics sector of Siemens AG will pass the break-even point this year, sooner than anticipated, according to semiconductor manager Juergen Knorr. Most divisions are already showing profits today. Next year, according to Knorr, the whole semiconductor sector will "yield a positive result." The growth in sales accelerated last year to 21 percent (sales in 1993: \$2.1 billion). Knorr wants to join the ranks of the Top Ten in the next few years.

—Daimler-Benz subsidiary Temic Telefunken Mikroelektronik GmbH in Heilbronn, sectioned off from AEG and German Aerospace as an electronics company in 1992, grew by almost 20 percent as the smallest and newest member of the European semiconductor quartet (sales: DM1.1 billion for semiconductors) and even showed profits.

[Interview with Doug Dunn]

"Good Money With Chips"

The semiconductor head at Philips sees no reason for European pusillanimity in the semiconductor market.

—Herr Dunn, are we still dependent on Japan in microelectronics?

Dunn: The Japanese will always be an extremely powerful challenge. But the danger of strategic dependency, particularly in storage chips, has been eliminated. Now Korean and American producers are in a similarly strong position in the storage area, and don't forget Siemens. There is plenty of competition. Along the whole spectrum of semiconductors things look even better. The

Japanese have no processors, the Americans are sharing the market among themselves. But they have few logic components for special applications, such as in the area of telecommunications. There Europe is very strong. The Japanese always dominated in standard products. But client-specific solutions will gain greatly in importance in the future.

—How could it ever come about that European chip producers became so weak?

Dunn: The semiconductor industry is a part of the whole electronics industry. And things went very badly with them in the past. Just think of the entertainment industry. And in the PC sector we have no domestic market worth mentioning.

—But these deficiencies still exist?

Dunn: Yes. But in the first place we have harsh rationalizations behind us. We are earning good money again in Europe with chips. In the second place, today we are much more client-oriented and go where our customers are. And in the third place, important growth markets are coming into existence in Europe, in which we have excellent starting positions.

—There is no general awareness of this yet.

Dunn: Unfortunately, you are right. We must finally shake off the image of being perpetual losers in the area of microelectronics. That is not only inaccurate, but even counterproductive. If we have no faith in ourselves we will not achieve anything.

—Won't the good prospects in the new markets be useless as soon as Japan and America attack with concentrated power?

Dunn: Our foundation is strong enough. But the question is whether we should continue with our present structure. I think that in future we will have to cooperate even more in order to share the high cost of investment in research and development or in factories. At the end of this decade we will have very many virtual companies, in which manufacturers work together in a very limited way towards a goal without being financially committed. Together with SGS-Thomson we have developed a 0.5-micrometer process which is being installed in the new factory in Crolles. Siemens has stated its intention of taking a partner on board in Dresden. Motorola, IBM and Apple developed the power PC together. These are signs of the structures of the future.

TELECOMMUNICATIONS

France: Status of Plans for Information Superhighway

94WS0324A Paris MESSAGES in French Mar/Apr 94 pp 36-37]

[Article by Laurence Alary-Grall: "First Starting Block for the 'Information Highways'"; first paragraph is MESSAGES introduction]

[Text] The new electronic roads will transmit voice, animated images, and data interactively, thereby opening up a whole new world of services and knowledge. "Information highways" are a huge public works project, kicked off recently in France by the prime minister. The following surveys the current situation and outlook.

France is setting out on the "information highways." The United States, where Vice President Al Gore is an ardent advocate, has made superhighways a top development priority. Now France is getting involved in the huge project, which was kicked off by Prime Minister Edouard Balladur during an interministerial meeting last 22 February. The goal is to install communication infrastructures that can transmit data, images, and sound interactively, throughout France. In other words, to set up the network of the third millennium, which will ultimately provide multimedia access to everyone.

Two major technological breakthroughs—fiber optics and the digital revolution—provide the background for the sweeping project. Together they obliterate the lines between telecommunications, audiovisual broadcasting, and data-processing, and will make it possible in the future to combine telephone, television, and computer in a single multimedia terminal. As Gerard Longuet, the minister in charge of the program, stressed during a council of ministers meeting 23 February, information highways are going to "profoundly modify the way many economic and social activities are carried out: [they will result in] more telecommuting, new forms of educational and training support, broad access to professional or leisure data banks, and the introduction of services tailored by the television viewer or consumer."

The government estimates the growth outlook for new communication technologies at 8 percent a year, or about 10 percent of Europe's GNP around 2000. This makes future multimedia networks of crucial economic and strategic importance, and explains the prime minister's plan to bring together all the players—France Telecom, cable companies, television stations, multimedia publishers, audiovisual producers, and computer service operators—in a "growth pact." The pact aims to raise several billion French francs [Fr] worth of investments, notably in cable, over the next three years. "But the economic objective must not take precedence over the essential public service mission of these infrastructures," stressed Edouard Balladur. The prime minister believes the government should play a dual role: "To ensure that electronic highways are developed in a way that meets the country's economic, social, educational, and cultural needs on the one hand. And to make them quickly available to the greatest number of households, schools, and businesses on the other."

The Minitel Precedent

The French initiative falls within the European perspective advanced by proposals of the "White Paper on Growth, Competitiveness, and Employment," which was prepared by the European Commission and adopted

by the Twelve's heads of state and government in late 1993. In it, the Commission estimates the total investment needed in the telecommunications sector alone at ECU150 billion (about Fr975 billion) between now and 2000. European information highways would absorb ECU67 billion, 35 billion to install a high-speed communication network and consolidate European ISDNs [Integrated Services Digital Networks], 12 billion for electronic services (electronic images, data bases, electronic mail), and 20 billion for information systems and services (telecommuting, on-line medical assistance, remote administration).

The Twelve set up a brainstorming group, headed by European industrial affairs commissioner Martin Bangemann, on 8 February to prepare the development of this "information society" and related new technologies on a continental scale. The group of experts will submit its conclusions next 24 and 25 June at the European Corfou summit, which will deal with the question of electronic highways and their funding.

In France, the national information highways project will benefit from a famous precedent: the success of the minitel, which now offers 23,000 services to 6.5 million terminal-equipped users and roughly 500,000 videotex desktops. As for Numeris, France's version of the ISDN, it spans the entire territory and can already carry voice, data, and still or slightly animated pictures. But its transmission speed is grossly inadequate for true multimedia and interactive use.

Hence the need to launch a new generation of "wide-band, very-high-speed" networks, which combine fiber optic equipment and new transmission and switching techniques, particularly ATM (asynchronous transfer mode). France Telecom has already invested heavily to equip its network with fiber optics. The public carrier is preparing to restructure its transmission network (the "national roads"), to convert it from a branching architecture to one that is "petal-like." It is also getting ready to launch the first commercial high-speed-transmission services via ATM in 1995. Moreover, France has undeniable strengths in industrial telecommunication products, notably Alcatel's mastery of broadband networks.

A Study Mission

But the performance level of a network is not the only thing to be considered. Much is at stake in the notion of information highways, including technologies, industries, regulations, and effects on civilization. What should be sent out on these highways, to meet which needs, and to provide what kind of new services? What should be the public service role of the information highways? Who will have what kind of access to knowledge? What sort of legal framework should "regulate" the roads—in other words, allow the flourishing of new markets and the jobs they will create while meeting general and regional development needs? How will the information highways complement cable?

The government has assigned the job of exploring all these critical questions to Gerard Thery, a former telecommunications general director whose name is linked to France's effort to "catchup" in telephones in the seventies and to the launch of the minitel. Gerard Thery will submit an analysis and proposals to the government this summer. His assignment is preparation for a bill that may be presented to parliament in the fall, before initial experiments get underway at the end of the year.

France: Silicon-Germanium Alloy for Bipolar Transistors

94WS0335B Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 15 Apr 94 p 8

[Text] Frankfurt. French scientists were recently successful in developing a silicon-germanium alloy which can be used for bipolar transistors with a limiting frequency of more than 50 gigahertz. According to the journal SEMICONDUCTOR INTERNATIONAL (Vol. 17, 1994, No. 1, p. 18), the laboratories of the National Center for Telecommunications Studies (CNET) of France Telecom have already exceeded a value of 100 gigahertz. Pierre Noblanc of CNET explains that the high frequency output is said to equal that of gallium arsenide transistors. The alloy of about 70-percent silicon and 30-percent germanium is used as a base for Biomos products with structural widths of 0.25 micrometers. Production is to begin in 1996. Advantages are anticipated for bipolar, Mosfet and Biomos products. He said that in Great Britain the company GEC Plessey Semiconductor in Swindon is likewise working on silicon-germanium alloys, but with the proportion of germanium 10 to 20 percent.

France: Special Properties Designed Into Chemical Materials

94WS0336B Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 27 Apr 94 p 8

[Unattributed article: "French Develop Materials With Several Properties"]

[Text] Frankfurt. Every material has some characteristic physical properties. According to recent research performed by French material scientists, it will be possible in future to plan materials so that they possess several properties which can be built into them in a deliberate and controlled way. Thus it will be possible in a single material to combine magnetic properties with specific non-linear optical properties which do not occur in nature and which it has hitherto been impossible to produce. The basic principles for the production of such new materials were discovered and investigated at the Laboratoire de Chimie Inorganique of the French Universite Paris Sud.

In the view of the French scientists, the combinatorial possibilities are unlimited, and this means that it will in

future be possible to go about creating completely new materials on the basis of requirement profiles. One of the first such materials they were able to obtain was crystallizing compounds which combine a very high magnetic value with the capacity to double the oscillation of light frequencies, that is, to produce light oscillations of the second upper harmonic oscillation in passing through the layers. At the same time the material possesses permanent magnetic properties.

The combination of these two important properties is brought about by deliberate construction of interconnected molecular structures, of which one component is responsible for the magnetic properties and another for the non-linear optical properties.

But in order to achieve this, the atomic lattices of the individual components must be made to interconnect. In the process, the structure of an inorganic compound determines the alignment and the intercalation of an organic compound. The developers say that the design gives rise to interconnected hybrid compounds which consist of both organic and inorganic molecules.

For continuing experiments the scientists are using "DAMS," short for dimethyl amino-N-methyl stilbazoline, as an organic compound. Because of its structure, it possesses non-linear optical properties if there is no domain formation with symmetry centers in the dipolar-type compound. In order to prevent this, these organic, color-bearing molecules are combined as chromophores with cations of a manganese salt and anions from phosphide sulfide. In the process a complex hybrid compound arises ($\text{MnO}_2 \cdot 0.86\text{S}_3(\text{DAMS}) \cdot 0.26$), whose inorganic components take care of the incorporation of the organic molecules in the requisite interstitial structure, and thus causes the molecular orientation for the optical behavior.

The new material created is permanently magnetic up to a temperature of 40 °K and doubles incident laser light over a relatively wide frequency range. The new material is available in crystalline form, but at the moment the question of whether it can be drawn out into thin films for frequency filters, for example, or applied to glass substrates in a few atomic layers, has not yet been thoroughly investigated.

The scientists are consciously refraining from investigating any practical applications more thoroughly yet, preferring to research the principles according to which the formation of such combinations of properties must proceed. For if these rules are known, a very large number of compounds can be synthesized which unite several properties, perhaps even opposing ones.

In some ways this method of synthesis may represent a complement to the sol-gel procedure which is commonly used today to build up new compounds from nanometer-sized components. In comparison with materials currently in use, which are designed to optimize a single property, the developers speak of a new generation of

"two-dimensional" materials. If more than two properties can be combined in a material, "multidimensional" materials are also theoretically possible. For further information: Universite Paris Sud, Laboratoire de Chimie Inorganique, F-91405 Orsay, France.

Germany: Satellites, Cable To Transmit Digital TV in Europe

94WS0336A Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 22 Apr 94 p 8

[Article by Karl Tetzner: "Four Stages To Highest Television Quality"]

[Text] Frankfurt. "Television was invented in Europe, and Europe wants to play a significant role in the digital age too," says the introduction to "Innovation Europe," sponsored for the fourth time by the Central Association of Electrotechnology and Electronics Industries. Television remains a significant factor: in Germany there are 44 million sets in operation. The total is about 160 million for Europe and 670 million worldwide.

The world of television is on the verge of emerging into the digital age. During the meeting in Berlin, Dr. Helmut Stein (Nokia) reported in detail that digital technology is now in a position to differentiate image and sound quality, i.e., to divide up the given bit rates as desired. But the price to be paid is some loss of quality. There will be four levels:

- Limited Definition Television (LDTV) achieves image and sound quality on the level of previous videorecorders. This requires a data rate of 1.5 to 2 megabits per second.
- Standard Definition Television (SDTV) shows TV programs with good PAL quality on a technologically modern receiver. The requirement is a transmission rate of 3 to 4 megabits per second.
- Extended Definition Television (EDTV) offers improved image and sound reproduction, sufficient for large screens, including those with a 16:9 height-to-width ratio and for the new PALplus system. Here the data transmission rate is 6 to 8 megabits per second.
- High Definition Television (HDTV) for high definition televisions with up to five sound channels is suitable for reproduction on very large screens. This requires a transmission capacity of 20 to 30 megabits. The data streams will consist of 188-byte packets; a byte is equal to eight bits. Thus they are adaptable for the future Asynchronous Transfer Mode (ATM) on the public broad-band networks. The first byte in the packet serves for synchronization, the next three for recognition of the data carried by the following 184 bytes.

As is well known, in the recent past over 100 institutions from 14 countries have been working on the technology and strategy of European digital television, and they agreed on the first standard (for satellite TV transmission) in December of 1993. The norms for cable transmission and terrestrial digital transmission will follow.

In Berlin, Stein gave the following timetable: digital TV via satellite and cable will begin in 1995. Terrestrial transmission, received with conventional roof antennas, could follow in 1997 and the highest quality level (digital HDTV) could be available beginning in 1999. There is no longer anyone who talks about European HDTV using the HD-Mac transmission process, which was developed at a cost of several hundred million German marks [DM] and given an expensive demonstration.

Dr. Herbert Bruch (Grundig) explained what will happen with PALplus, the system which can completely fill the broad picture surfaces of the new 16:9 [as published] sets. ARD plans to offer about 300 PALplus program hours this year, and Baerische Rundfunk an addition 300. The pay-TV broadcaster Premiere is even promising 1,000 hours. But the equipment industry is not braced for this tempo. Originally, they had been counting on PALplus beginning in the summer of 1995.

In the meantime, some equipment manufacturers have been making use of ASIC chips. It is true that they are more expensive than the later mass-produced chips, but will be available sooner. In this way the first PALplus-equipped 16:9 [as published] receivers could appear in the stores before Christmas, with a price increase of about DM350. PALplus is also completely compatible with the less advanced PAL standard.

Germany: Alcatel SEL Undergoes 11-Percent Decrease in Turnover in 1993

94WS0359B Munich *COMPUTERWOCHE* in German 13 May 94 p 4

[Article by HI: "Alcatel SEL Records Negative Turnover of 11 Percent for 1993; Two New Companies as Well as Concentration of Production Expected to Increase Efficiency"]

[Text] Stuttgart. The Stuttgart telecommunications equipment manufacturer Alcatel SEL, a subsidiary of Alcatel, recorded a drop in turnover of 11 percent, from 6.3 billion German marks [DM] to DM5.6 billion, in fiscal year 1993. In addition to the general weakness of the economy, the company sees the continuous drop in prices as one of the reasons for the loss. The people in Stuttgart want to form two new companies and close down a production unit to lower costs and increase efficiency.

In the words of chairman of the board, Gerhard Zeidler, the overall economic situation is also reflected in the number of Alcatel SEL of order entries. In comparison with the previous year, with a volume of DM5 billion,

the people in Stuttgart received 20 percent fewer orders and had an order volume of DM4.8 billion at the end of 1993.

The German part of the company managed to earn a surplus of DM107.2 million in 1993, while only the year before it made a profit of DM160.1 million. According to Zeidler, this deficit is essentially attributable to the negative effects of volume and prices. Despite the general drop in turnover of 10 percent among suppliers of communications hardware, at Alcatel they do not want to get into the booming operator market, since a confrontational course with current customers is to be avoided. However, Alcatel will also further participate in the operation of the networks, as in Kazakhstan, if the carriers so desire.

To be sure, Zeidler does not expect his company to grow again in 1994, but he does hope to keep it at its 1993 level. As for the future, the chairman of the board wants to develop new lines of business, such as interactive television, corporate networks, and traffic management.

To lower costs and increase efficiency, Zeidler plans to concentrate telephone exchange and broadcasting technology at the plants in Gunzenhausen, Arnstadt, and Rochlitz and to close down the production unit in Stuttgart. The state capital, the chairman of the board said, "will continue to be the biggest plant, but with a new commercial focus." In Zeidler's words, "software and services should have a future" in the Swabian metropolis.

Furthermore, the company management plans to set up two companies. The mobile communications product department is supposed to be converted into a company by as early as 1 July 1994. The detachment of the company's office communications department is scheduled for 1 January 1995. Zeidler has high hopes that these measures will concentrate authorizations to make decisions and produce better cooperation in the international Alcatel combine.

As a consequence of the reorganization and the concentration of production, the company wants to eliminate another 1,500 jobs by the end of 1995. About 600 jobs will be affected by the cuts at the Stuttgart plant, which at present provides about 900 jobs.

Italy: National Telecom Company Projects Described

M13105101894 Turin *MEDIA DUEMILA* in Italian Apr 94 pp 52-54

[Article by Claudio Donat-Cattin: "Iritel, Bridge Over the Mediterranean"]

[Text] Rome -The "telephone stew" is about to go into the archives. The *MEDIA DUEMILA* readers, who have followed the difficult battles that have taken place over the last few years to attain a single telecommunications operator, know this well. It has been a rocky path full of

snarles that the Tangentopoli [Kickback scandal] events have enabled us to understand better.

Today we are on the verge of forming Telecom Italia. The boards of directors of the five companies that are involved in the merger approved the balance sheets at the end of March, and the unification of the installations should be concluded on 30 September. It is an epoch-making event, and an indispensable requisite for presenting oneself with the right cards at Community meetings focusing on the complete liberalization of the telephone services market.

MEDIA DUEMILA dedicated an entire edition (Issue 114, published December 1993-January 1994) to a description of the history, technology, and policy of the reorganization. This complete documentation also made those outside the telecommunications world understand that Italy is staking a large part of its industrial future at this table.

In an atmosphere that is characterized by continual sudden dramatic events, hasty marriages, and equally hasty divorces, it is opportune to open a window on the youngest of the five Italian operators. We are talking about Iritel, a company that was set up on 1 January 1993 to inherit the functions of the ASST [State Telephone Services Agency].

It was a weighty inheritance. The tangles of the unsuccessful reorganization were mixed up with questionable real estate policies that in some cases have come under the scrutiny of the "Kickback" judges. An excessive number of personnel (almost 13,000 employees), who had become unmotivated because of the prospect of a future that was rich in uncertainties, must be added to this. There were all the conditions for giving up, or for moving toward reorganization into the most ordinary administration. All this obviously reflected on the quality of the service and consequently on us, the citizens who are its clients. Let us not forget that the ASST network was (and is with Iritel) the backbone of long distance traffic.

However it was not like that. In 15 months there has been "a silent revolution" that has changed the appearance, habits, and rhythms of a company that was closer to collapse than to relaunching.

It is a story that deserves being told, in an Italy where the "little bosses" of the public sector seem to be the order of the day, and where only bankruptcy and crime make the news. It is a story about men, about a group of managers who are professionals and have known how to interpret the desire for change without fear. It is not flattery to say that when uncontested managers look out over the deck, the outraged public is also able to get away from the adverse daily routine.

This is how it has been for Iritel. To understand what has changed it is sufficient to spend a few hours wandering around the building in via Europa, in EUR [Rome], that houses the head office of the central administration. One

breathes a different air, it is a place where bureaucracy has finished up in the attic. The therapy has certainly not been painless. The company has been drastically slimmed down. The number of employees has been reduced to a little over 8,000 and the final goal is 6,500. There was a close confrontation with the trade union, that was also favored by the seniority of the personnel in service. Training and requalification courses are being started to adapt to the requirements of computerization and new technologies.

Moments of friction have not been lacking, but the final results show that there was no other way to regain competitiveness. The gamble was to invest in the quality of the network and services, and at the same time align the tariffs with those existing in the European market. A course that has made Iritel the first case of "administrative privatization."

The inserts accompanying this article [not provided] describe the missions and goals of Iritel and constitute a plan leading to its merger into a single administration.

It is more interesting to analyze certain strategic choices that were made at the beginning of 1993, and that are becoming concrete realities today.

Winning New Markets

Iritel's submarine cable network is the most extensive in the Mediterranean, and it is a real bridge between Africa and Europe, and between the countries of the East and the Mediterranean basin. Agreements are being worked out with various partners. One particular goal is to turn the international network into one of the most important windows through which the Russians and their economy can look out on the western world. This is a strategic goal, even if today 80 percent of the traffic takes place between the countries of western Europe.

A series of initiatives in the field of submarine cables are to be remembered: The ITUR (Italy-Turkey-Ukraine-Russia) cable, that is destined to connect Palermo to Moscow; the TLB (Italy-Albania-Macedonia-Bulgaria-Turkey), that will join Istanbul to Bari; the cable from Italy to Tunisia, and others. In less than two years the 3,000 kilometers of submarine cables (mainly analog) will be increased to over 7,000 kilometers of cables that are almost exclusively digital.

The network of submarine cables in Italy will be extended by a further 1,500 kilometers when the Civitavecchia-Olbia, Palermo-Cagliari, and Savona-Sassari lines are laid.

Investments

A total investment of 3.4 trillion lire is planned for 1993-1994. The primary goal is to continue with the modernization and technological innovation processes to digitize almost the entire network (90 percent by the end of the year).

Special Services and Networks

International competition can only be faced by offering special networks. In 1994, the goal will be the diffusion of private international virtual networks. A service to the United Kingdom has been offered since last October, and one with France since December. Services with Holland, Switzerland, Belgium, Spain, and Germany will be started during the first six months of this year.

The "Global European Networking," which Iritel joined in September 1992, has made a flexible network connecting the principal European countries available to the Italian communications system.

At the same time, in agreement with the SIP [Italian State-Owned Telephone Company], a major effort is being made to diffuse the ISDN [integrated services digital network] network that is particularly useful for business users. This will enable Italy to align itself with the diffusion trend of the French, German, and British operators by 1996.

The START Project

This is the feather in the cap of Iritel's investment plan. A total of 715 billion lire will be invested over 1993-1994 to extend the optical fiber network that is available to business users. A total of 6,299 kilometers of optical fiber cable will be laid for the ground network, to create about 206,000 kilometers, and 400 systems of 565 Mbit/s [second] will be installed.

The submarine network (as we have already mentioned) will be further upgraded by a total increase of 1,337 kilometers of cable and 10,710 kilometers of optical fiber, with 18 line systems at 565 Mbit/s.

Tariffs

There have been two tariff reductions in the past year (the first by 30 percent) and these have brought our tariffs into line with those in Europe. Looking ahead this will particularly favor the business user.

The Moral Issue

The new administration, with its clear and transparent rules, has marked a turning point with respect to the management of the ASST that was violently shaken by the Kickback cyclone. As General Manager Tommasi stressed, they have turned a leaf "by revolutionizing the regulations and procedures on bidding for tenders in a European context, and by establishing a new procurement office management, whose task will be to work in a transparent way and to avoid overlapping and waste with the other operators."

A Model for the Future

Business culture and competitiveness have been the two key words around which work has focused for only 15 months. These are two decisive words for the future of the sole operator, which Iritel certainly will not become

a part of by entering through the back door, and will introduce concrete results and a group of managers who are able to meet the new challenges.

In an Italy that is suffering from patronage and back-handers, it is important to discover that there are humane professionals in critical fields if we want to remain among the leading group of industrialized countries and avoid sliding into the second division.

Mobile Radio to Gain Equal Footing with Other Systems

94WS0321A Duesseldorf VDI NACHRICHTEN
in German No 14, 8 Apr 94 p 15

[Article by Markus Schnurpfeil: "Mobile Radio Operates on Equal Footing alongside Ground Networks"; "European Study Concerning Future of Mobile Communication"]

[Text] VDI NACHRICHTEN, Bonn 8 Apr 94—In its most recent study the Eutelis Consult consulting firm predicts that, as the turn of the millennium approaches, it will be possible to reach telephone subscribers at the same one number regardless of whether their receivers are part of a ground or mobile network. In this way will the various network systems be integrated, as the authors of this study, Ulrich Kranz and Dr Gurnad Sodhi, explain in an interview with VDI NACHRICHTEN.

VDI-NACHRICHTEN: Mr. Kranz and Mr. Sodhi, the mobile radio study which your consulting firm has made on behalf of the EU-Commission is concerned with scenarios of mobile communication in Europe by the year 2010. In your analysis, however, you surprisingly often refer to already now available technologies. How does this jibe?

Kranz: With adoption of the European GSM Standard, on which both German mobile radio networks D1 and D2 as well as the new E-network are based, there has been initiated an extremely dynamic development. This development has been sort of the starting shot for the future of mobile communication, in which GSM networks will certainly play a significant role. This is because these networks offer not only a large subscriber capacity. They also offer a whole lot of functional advantages such as, for example, International Roaming and thus communication across international borders.

Sodhi: A further example is DECT, an already now available technology which seems to have a quite significant potential for future applications in mobile radio. First of all, this Standard is the basis for development of cordless telephones and cordless telecommunication facilities. At the same time, DECT is also an excellent accessing technology which facilitates, for instance, linking subscribers of local networks via radio to other telecommunication networks. In other words, with DECT in place, competition with the local network (Local Loop) could begin sooner or later. This example

demonstrates clearly that in the foreseeable future the significance of mobile radio will fundamentally change.

VDI-NACHRICHTEN: What will this change lead to?

Sodhi: Today when we speak of mobile radio, we mean networks and attendant services which widely differ from those provided by ground networks. As a D-network customer, I can naturally reach a party connected to a conventional network. With a telephone installed at home and another one at the office, and also with a hook-up to a radio mobile system, I now have three telephone numbers and the caller does not know at which one I can be reached at any given time. This will not be so in the future, because I will have just one personal telephone number...

VDI-NACHRICHTEN: ...at which you can be reached regardless where you are located.

Kranz: Precisely. The various network infrastructures will be integrated into a "Personal Communication System" (PCS). The connection will be made by an intelligent exchange apparatus which always knows the location of the party called and will steer incoming calls over the appropriate network to that party. As to the question about the changing significance of mobile radio networks, they will operate in a Personal Communication System on practically equal footing with ground networks.

VDI-NACHRICHTEN: Who will be the providers of such services?

Sodhi: In our opinion the service providers, being already active in mobile radio operation, will play an essential role in its expansion. They will put together packages of telecommunication services tailored to the needs of customers in diverse user categories. I repeat: the PCS will not be based on one technology alone but rather will be a hybrid system combining several technologies such as GSM 900, GSM 1800, DECT, and the ISDN [Integrated Services Digital Network] ground network.

VDI-NACHRICHTEN: And does this not also mean that different customers may be receiving different services?

Sodhi: Certainly. Whoever wants to be reached only at home or in a certain area thereof will receive a different package of services than someone who requires telecommunication services at the office and during international business trips.

VDI-NACHRICHTEN: What functions are taken over by the queuing strategy with regard to setting up guideposts for the PCS scenario you are describing?

Kranz: Certainly that of a central station, because development of mass markets for Personal Communication services can succeed only when the constraints have been optimally defined.

VDI-NACHRICHTEN: And this means, for instance,...

Kranz: ...that viable competitiveness must be made the overriding principle in the development of mobile radio and telecommunication on the whole. This is why, for instance, private network operators should be permitted to install their own lines linking them to radio base stations for use of exchange computers of mobile radio networks.

Sodhi: In order to assure an effective competitiveness, it is also necessary that the relation between network operator and service provider be already stipulated in the licensing of mobile radio networks.

VDI-NACHRICHTEN: Assuming that the queuing strategy constraints are correctly defined and the effects of fair competition become fully realized, how many European users will avail themselves of Personal Communication System services?

Kranz: We are starting on the premise that in such a case there will be up to 80 million European PCS users by the year 2010. Certainly, essentially instrumental in attracting such a large number of subscribers will be a network operators' and service providers' rate-setting strategy. In our opinion the PCS will grow on the mass market when the prices for manual mobile telephones and the monthly basic charges have fallen down to 100-150 German marks [DM] and below DM15 respectively.

VDI-NACHRICHTEN: When the PCS is now based on already available or soon to be introduced technologies, what comes next?

Sodhi: Over the long range we will experience developments in mobile radio comparable to those taking place in ground networks, namely, integration of all services in one universal network and flexible transmission over various different frequency channels of this network, as the user may require.

VDI-NACHRICHTEN: Thus a sort of ATM [Asynchronous Transfer Mode] for mobile radio?

Sodhi: Yes, one could describe it as such. Preliminary work is underway at the European Standardization Institute (ETSI) on establishing a Standard for a Universal Mobile Telecommunication System (UMTS). Meanwhile groups of experts at the International Telecommunication Union (ITU) are doing similar work directed toward a Future Public Land Mobile Telecommunication System (FPLMTS). These two developments have, in principle, the common goal: a high-performance mobile communication system with a very large subscriber capacity and which in the long run will integrate all other mobile radio services.

VDI-NACHRICHTEN: When, in your opinion, will such a marvelous concept of mobile communication become reality?

Kranz: We are starting on the premise that a technology based on the UMTS Standard will be introduced at the turn of the millennium. Services with transmission

speeds up to 2 Mb/s should be realized during the initial phase. Still higher speeds will be attained later on.

VDI-NACHRICHTEN: A multimedia-capable mobile communications system is what this is, then.

Sodhi: The UMTS will integrate not only all services but also all forms of telecommunications. And this also includes, of course, image communication.

[Boxed material]:

Pillars of Mobile Communication

At the present time the status of mobile communications is determined by two standards: 1. Global System of Mobile Communication (GSM) Standard, which covers digital mobile radio in almost 60 countries including

both German D1 and D2 networks; 2. Digital European Cordless Telephone (DECT) Standard for cordless telephones in Europe.

Study for the Green Book

The study concerning the future of mobile communication was one of three mobile radio studies made by Eutelis Enterprise Consultants in Ratinger in preparation of the planned "Mobile Communication" Green Book for the European Union. In this Green Book, the draft of which is now being discussed in Brussels and the final version of which is to be ready this year, the EU-Commission will have laid down its concepts of mobile communication development in Europe and begun setting up the necessary guide posts for a queuing strategy.

DEFENSE R&D

Romania: Threats to Research Funding Described

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Romanian 21 Apr 94 p 4

[Unattributed article: "Science Research on the Verge of Collapse"]

[Text] One of the most important victims of transition is the scientific research funded from non-budgeted sources. This victimized research—mostly technological—is done in about 80 percent of all the science institutes, which are supposed to survive by covering half of the expenses on their own resources (contracts, microproduction, etc.), while the other half from a special fund, representing 1 percent of the economic units' production.

In many cases, because of the financial blockage, these institutes are so poorly funded that they can no longer satisfy their obligations. In 1993, only 50 percent of the special fund could be collected. For instance, SIDEX Galati presently owes over 4 billion lei, which the company serenely admits it can't pay. The fines, recently doubled, no longer have any effect. As a consequence,

the Ministry of Research and Technology administering the fund started 1994 with 80 billion lei of unpaid bills (arrears). In the attempt to liquidate them, during the first trimester of the current year, the ministry has been thus unable to provide practically any kind of financial support to research organizations in their charge. So the situation of the latter became dramatic. Many institutes had to resort to loans of ruinous interest in order to cover, more or less, the payment of salaries. A new wave of dismissals looms on the horizon, especially for the specialists. Some institutes might even have to go as far as to interrupt their activities altogether. The severe, long-term consequences of these developments can be easily comprehended.

During a recent meeting with the press, Dr. Eng. Dumitru Doru Palade, the minister of research and technology, has categorically denied rumors that this special fund intended for supporting scientific research will be terminated. According to him, new financing sources for this vitally important activity for the nation are assiduously being sought. This situation could be improved by terminating the financing of geological prospecting, which is supported by the same fund and is also in arrears.

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